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EDITOR'S

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This issue you can get inspired by our exclusive interview with ILM's John Knoll about reinventing Star Wars VFX for Rogue One. Plus, master the fundamental CG techniques of modelling, texturing and rendering to create Darth Vader and K-2SO. And we meet a team of artists who recreated Mos Eisley in Unreal Engine 4!



Ian Dean, editor
ian.dean@futurenet.com

SPOTLIGHT ON OUR CONTRIBUTORS



John Knoll
Industrial Light & Magic's chief creative officer and senior VFX supervisor discusses the need for familiarity in Star Wars: Rogue One on page 20.
www.ilm.com



Ansel Hsiao
Ansel is a microbiologist and freelance 3D artist based in Saint Louis, Missouri. On page 52 Ansel shares his process for modelling a Star Destroyer in 3ds Max.
www.fractalsponge.net



Riyahd Cassiem
Riyahd is a freelance digital artist who creates VFX, motion graphics, 3D characters, and concept art. On page 60, he shares his ZBrush workflow.
riyahdart.blogspot.com



Jacob Norris
Jacob has over 10 years' experience creating art for video games, and offers training and assets on his PurePolygons website. Follow his advice for modelling perfect game foliage on page 72.
www.purepolygons.com



Francis-Xavier Martins
Francis-Xavier is a character artist and CG generalist based in Brighton, with over a decade of experience in video games, media and TV. He joins our Artist Q&A team on page 88.
www.polyjunky.com



Steve Teeple
Steve is part of the future-arts collective and production company Teaching Machine. Steve is currently road-testing Oculus Medium, a VR sculpting tool. See page 96.
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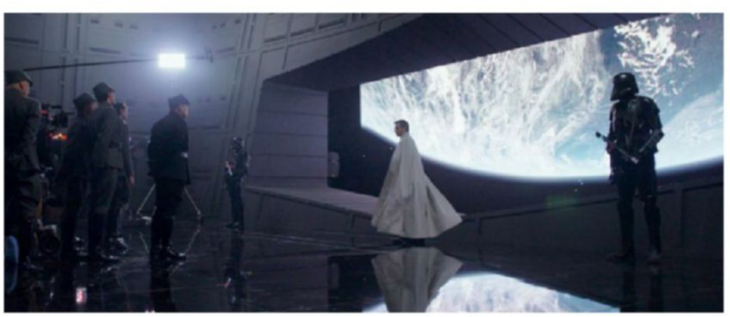
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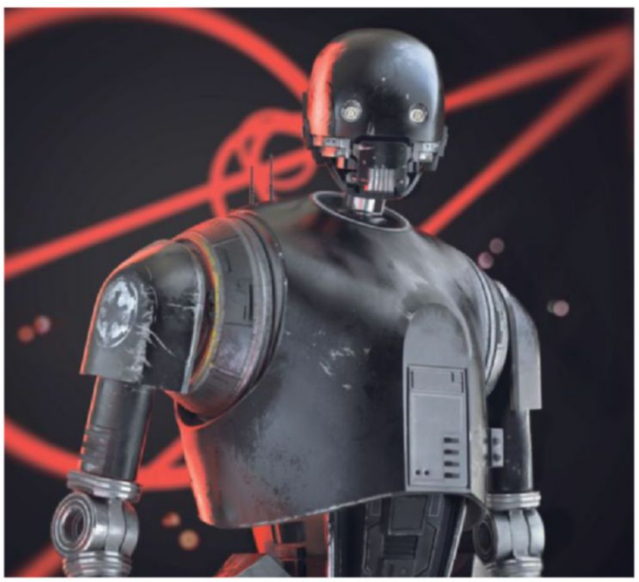
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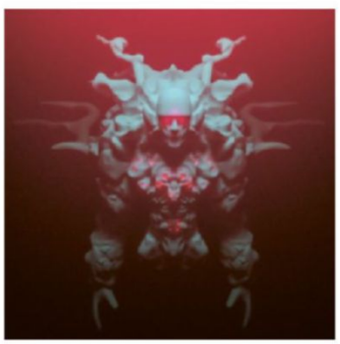
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Student Artist Rian Smith
Mech Concept by Zoey Tu

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THE JOURNEY: STRANGER WORLDS

ARTIST
Santiago Betancur
SOFTWARE
ZBrush, Photoshop, Best Preview Render (BPR)

"I love to do abstract things," says concept artist Santiago. "This time I was inspired a lot by artists like H.R. Giger, Zdzislaw Beksinski and Peter Gric, after I looked at their work I felt motivated to do something like them."

The artist uses a simple workflow, ZBrush and Photoshop, with rendering being handled inside ZBrush by BPR. "I use BPR a lot for my work, it is so fast and gives me nice results, and I can have a lot of control over my render passes," explains Santiago.

Once rendered, Santiago likes to bring the scene to life using photobashing techniques. Every new project is a chance to learn.

"This [project] took me entirely out of my comfort zone, so I learned a lot of techniques for environments like matte painting, photobashing and composition," says Santiago. "This was very fun and helped me in creating my next environment illustrations."

● www.artstation.com/artist/santiago_betancur



PILOT SQUAD



ARTIST
Vladislav Ociacia
SOFTWARE
3ds Max, V-Ray, Photoshop, Magic Bullet Looks

"I was inspired by a documentary film about pilots and I wanted to create my own, robotic pilot," says Vladislav.

Robots are a passion for the artist who enjoys modelling the intricate details of machines. "I love creating robots. I enjoy working on cables and wires – maybe in a past life I was a cableman," he jokes.

To render his machines, Vladislav chooses V-Ray: "It gives great, realistic renders with a huge amount of options and passes. I used it when I started my career, and for me it's still the best."

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KAYLA



ARTIST
Gabriel Belluco
SOFTWARE
ZBrush, 3ds Max, Marvelous Designer, Maya, Arnold, Mari, Yeti

Creating the Kayla portrait meant doing something artist Gabriel had never done before, model hair.

"The hair was the hardest part for me because it was my first attempt," he says. "In this particular case I used ZBrush FiberMesh to make the hair curves, and then I exported them to Yeti to apply guides. For the braids I used a different approach, I modelled them and converted the mesh into Maya Hair using a script."

With everything done – sculpting in ZBrush, retopology in 3ds Max, cloth in Marvelous Designer – Gabriel says it's time for his favourite stage, rendering: "It is when you put all the pieces together and see your work take form," he explains.

www.gabrielbelluco.com

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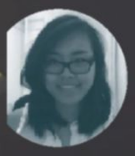
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AHOY!



ARTIST
Arianna Mao
SOFTWARE
Maya, Substance Painter, Mudbox, V-Ray, Photoshop

"This project was done over the course of a month, working about six days a week, or roughly three seasons of Buffy the Vampire Slayer," says Think Tank Training Center student Arianna Mao, who based her render on an illustration by Teressa Ong.

"I enjoyed lighting and texturing the scene the most," Arianna continues. "Lighting contributed the most to that feeling of nostalgia and it was just so much fun capturing the quality of a golden sunlit afternoon."

Texturing was a learning process, Arianna wanted to master creating complicated shader networks and navigating the nodes and different materials within Maya's Hypershade.

"I was aiming for a stylised look, I was able to use tileable materials for some of the objects in the scene, and most of the objects in the scene had tiled bump maps. This allowed for faster render times." she says.

So what did Arianna learn from the project? "I learned that it is critical to constantly check the look of the product as a rendered image," she says. "It was a huge morale booster to be able to track through the history and see all the different little improvements I've made throughout the work, and also helped me identify key areas to really work on."

www.bellewetherart.com

ZATANNA STATUE FOR PRIME1 STUDIO



ARTIST
Steferson Rocha de Sousa
SOFTWARE
ZBrush, Maya, Mudbox, V-Ray, XGen, Photoshop

Steferson is a 3D artist at Brazilian advertising agency Zombie Studios. This stunning model of DC's Zatanna took the artist eight months to create in his spare time, and will be turned into a statue by Prime1 Studio.

"The creation of clothing and accessories was a fun and challenging process, especially in the character's pose because I had to make good folds," says Steferson.

The project began as part of a workshop being run by Bruno Camara, to create a cinematic character. "I saw many concepts but nothing that inspired me. After a while I saw the incredible art of Adam Hughes on my Facebook feed, I had already been following his work for a long time and his Zatanna woke in me the will to produce it. I changed some things but my biggest inspiration was the art of Adam Hughes."

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ALIEN



ARTIST
Alex Vasin
SOFTWARE
ZBrush, 3ds Max, Maya, Substance Designer, V-Ray, Photoshop

Created for an Alien Vs Predator cinematic for game studio Plarium, Alex couldn't believe his luck. "It was a genuine honour to be involved in the AVP cinematic trailer, not least because H.R. Giger is one of my favourite ever artists," says Alex. "I have followed his work since I was in elementary school, and I have dreamed of creating art for the Alien franchise from the time I began to study 3D design. Now that dream has come true, and I feel very happy about it."

Posing the fearsome creature was made easier as it was being used in a cinematic. Alex explains: "The pose I chose was intended to be dynamic and expressive, but first and foremost interesting for the viewer. Fortunately, because the model was initially created for the cinematic trailer, it already had such a pose, but it was still necessary to adjust the model skin because its geometry would break in some of the poses I was preparing for rendering. However, that in itself was a lucky break, mainly because it gave me the chance to try my hand at rigging too."

www.artstation.com/artist/obriy86



ROGUE ONE: A STAR WARS STORY

Discover how you make a science-fiction movie that's in touch with its past, as **Trevor Hogg** talks to ILM's **John Knoll**

Rogue One: A Star Wars Story marks the start of a series of movies that explore the origins and back stories of various historical events and characters that are part of the cinematic universe conceived by George Lucas.

"As far as I know I'm credited as executive producer, story by, and visual effects supervisor on the movie," says ILM's chief creative officer and VFX supervisor John Knoll, who took part in discussions about story, design, costumes and casting for the project based on his idea. "It began informally in the company after the new slate of Star Wars films was announced. There were Episodes VII, VIII and IX which continue the Skywalker saga, but intriguing to a lot of us was this idea of doing films that are in the Star Wars universe, but weren't part of that through line. They could be their own self-contained, standalone stories that don't have to have any characters in common. One of them announced was the Han Solo story which is a wonderful opportunity to find out who this mysterious character that we meet in Episode IV is, and find out how he became the person we see there.

"I wanted to do some adventures with characters who we don't know, so I pitched informally to friends this idea of the rebel spy mission to steal the Death Star plans. I got these enthusiastic responses back when I would do this little 30-second version of it. 'Imagine this.' Encouraged by that, I started to get a little more elaborate with each telling."

Many, many stars

Two new locations appear in the science fiction heist helmed by Gareth Edwards (Godzilla) and starring Felicity Jones, Diego Luna, Ben Mendelsohn, Donnie Yen, Riz Ahmed, Mads Mikkelsen, Alan Tudyk, Jiang Wen and Forest Whitaker. "I can't claim credit for Jedha or Scarif, which were the result of Doug Chiang [co-production designer] and Gareth working together on what they



ROGUE ONE: A STAR WARS STORY

DIRECTOR
Gareth Edwards

VFX STUDIO
Industrial Light & Magic

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www.starwars.com/films/rogue-one





On set in Iceland: a Death Trooper gets the wet-look treatment, ready for his close-up



Director Gareth Edwards was keen to juxtapose the familiar with things we hadn't seen before, such as Death Troopers wandering over verdant land

wanted some of these environments to be," reveals John. "Gareth wanted to shoot in some place like Jordan. We ended up in Wadi Desa right next to Wadi Rum where big parts of Lawrence of Arabia were shot. It's spectacular terrain. Jedha came from Gareth wanting to shoot there. How do we make that planet not look like any other desert planet we've been on because we've got Tatooine and Jakku? Some of it's colour palette. We're doing more Mars-like colours on the planet but with the idea of it being a cold environment with snow visible at times." The original concept called for there to be permafrost on the desert moon that is the home of the Kyber crystal contained in the Jedi weapon of choice – the Lightsaber.

"There was talk early on about taking a lot of our photography from Jordan, and adding snow and permafrost into that, but in the end we decided not to go in and do all of that. However, you can still see some of the permafrost and snow in the wide views of the planet from orbit."



A THEME OF THE WHOLE MOVIE IS TO JUXTAPOSE SOME OF THE FAMILIAR WITH THINGS WE HAVEN'T SEEN BEFORE

John Knoll, CCO and VFX supervisor, Industrial Light & Magic

Laamu Atoll in the Maldives served as new planet Scarif. "I don't think we ever establish what it is a moon of," states John. "The idea is that this bright sunny tropical paradise is juxtaposed with the war events that are going on there. Gareth wanted to have that contrast which we haven't seen in Star Wars before."

A theme of the movie is to juxtapose familiar things from the Star Wars universe with things we've not seen before, as seen with Stormtroopers marching through clear blue waters. John recalls what director Gareth Edwards said: "You want to bring something new to it, otherwise, why are we telling the story?"

Orbiting the moon is the infamous Death Star. Recreating this was a unique problem as it needed to be digitally recreated without having access to the original model, because it is now owned by a private collector. "We were going to need to see it a number



Ben Mendelsohn plays Director Orson Krennic, the man responsible for getting the Death Star ready



of different times from various angles," says John. "I wanted to make sure that we got it right so I made a little hobby project last year when we were in pre-production – collecting every good photograph that we had from our image archives and even on the internet. We projected our imagery onto a sphere and then unwrapped it into texture space so we had a good template. Then I did some nice high-resolution textures, which lined up with the template so that we had all of the panels in the right place."

Model behaviour

"A fun aspect of this project is that we do catch up to much of what you see in Episode IV with the vehicle designs," remarks John. Our X-Wing and TIE Fighters are matched as closely as we can to the original motion-controlled models. Given that they were framed in a little tighter than was ever done in New Hope there's better detail in the

MANUFACTURING K-2SO

How a set of stilts designed to help amputees walk again turned actor Alan Tudyk into a towering enforcer droid

An imposing Imperial security droid is reprogrammed by the Alliance and follows in the footsteps of C-3PO in supplying unintentional humour. "We've gotten good at doing hard-surface assets," explains ILM CCO & VFX supervisor John Knoll. "We went through a couple of iterations of how dinged up and scratched K-2SO should be. That came together quickly.

"There was a full-size maquette that was built by Neal Scanlan's team for design evaluation and as a lighting reference model. We had his head that we could carry around on set and take reference photographs of, but then for performance it's Alan Tudyk in a motion-capture suit."

There was no motion-capture stage work for the character, however. "Alan was on location like any of the other actors. We tracked his motion, put our rendered K-2SO on top of him, and painted out whatever got covered up. Alan was standing on these amazing stilts that are smart and motorised so that they have an ankle motion that's natural to walk on. When you're walking with more traditional stilts the motion is not fluid and will seem affected."



Alan Tudyk wore the mocap suit that drove K-2SO's performance



ILM are used to creating hard-surface assets, such as this rebel-owned Imperial enforcer droid



LED panels were utitlised to emulate the correct, real-world lighting for the cockpit scenes

execution. There's one Imperial shuttle we've seen before but the other ones are new, yet feel like they're from the same factory and design team."

Two new vehicles make an appearance: "The U-wing is like the Rebel troop carrier so it's meant to be a bigger thing to what we've seen before, which is more of an attack ship or bomber. It's got influences from a Y-Wing and X-Wing in there. The idea of the AT-ACT is that it's an earlier model of AT-AT. It has shared pieces with the design of the later, more heavily armoured AT-AT, but it's thinner and less well-armed because it's more for transporting cargo than a walking tank," describes John.

Most of the aliens were produced by creature effects supervisor Neal Scanlan and the costume of Darth Vader was rebuilt; however, the Stormtrooper outfit needed a digital upgrade. "We saw a bunch of the original props and costumes out at the archive building. Due to limitations of the era, the Stormtroopers' helmets were lumpy and had sloppy paint lines. It was fine for a grainer film stock in a theatre where the film will be jumping around in the gate a bit, but the way this movie was being shot with the Alexa 65 camera and sharp lenses, I didn't think that stuff would hold up. So what we did is a better implementation from the original design. When you see them at a distance they look exactly the same but when you get framed in tighter there's better detail in there. For example, the respirator in front which was vacuum-formed into one piece now has part lines."

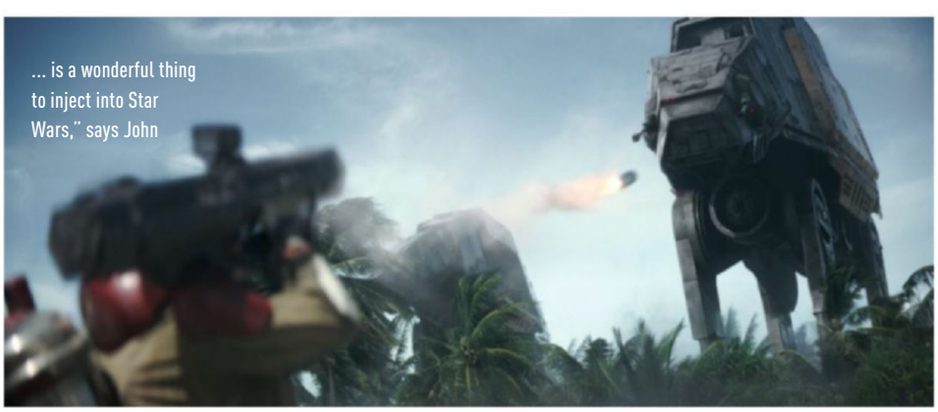


WE ACQUIRED A WHOLE BUNCH OF THE ORIGINAL MODEL KITS, THEN BUILT DIGITAL VERSIONS OF THE PARTS

John Knoll, CCO and VFX supervisor, Industrial Light & Magic



"Gareth's approach towards shooting is cinéma vérité...



... is a wonderful thing to inject into Star Wars," says John

An important aspect of the Millennium Falcon and Star Destroyer aesthetic was the way the models were built, using plastic model kits for Formula One cars, artillery pieces, rockets and tanks to detail the basic forms. The same process was updated for Rogue One: "We went through a process of acquiring a whole bunch of the original model kits that were used to build all of the ships in the 1970s, then built digital versions of the parts so that our modellers could construct the ships in the same way."

Documentary-style shooting

"Gareth's approach towards shooting on Rogue One is a cinéma vérité, documentary style which is a wonderful thing to inject into Star Wars," observes John. "It has much more of a found footage kind of feel to it. When we were doing all-synthetic scenes, such as the space battle and some of the aerial fight down at ground level, I wanted to make sure that the cinematography had that same kind of cinéma vérité look and feel."

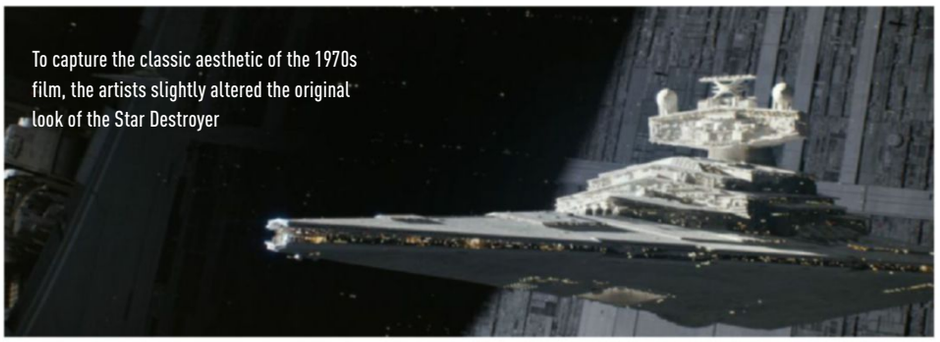
Since Gareth operates the camera on 75 per cent of the live-action, motion-capturing the cameras became be a good way to inject the same kind of composition and

CREATING DESTROYERS

Star Wars' famous ships get a makeover

In the opening shot of the original Star Wars Episode IV, a star destroyer engulfs the screen. When it came to recreating the enormous Imperial battleship, ILM's CCO and VFX supervisor John Knoll produced an altered version for Rogue One.

"In terms of timeline we wanted our Star Destroyer to look like the Episode IV Star Destroyer, which was a three-foot model but it was not as detailed as the eight-foot model. For example, the three-foot model did not have any internal lighting. There aren't any portholes or lights along the detail ridge on the side. Everybody recalls those aspects well from The Empire Strikes Back and even remember seeing them in A New Hope despite the fact they weren't there. We did a hybrid model featuring the most prominent features of the three-foot model with the nice detail lighting scheme from the eight-foot model."



To capture the classic aesthetic of the 1970s film, the artists slightly altered the original look of the Star Destroyer



"We wanted our Star Destroyer to look like the Episode IV Star Destroyer," says John Knoll

cinematography into the CG scenes. John says: "We did lots of prepping of scenes, mocap volumes, and then let Gareth walk around with our virtual camera to record his own coverage."

LED panels were deployed to emulate the proper lighting for the cockpit scenes. "These are massive jumbotrons that you see for animated billboards or at sporting events," explains John. "Essentially we're taking image-based lighting like with CG and bringing it back into the real world. Vehicle cockpits are a perfect example of travelling through a complex environment that makes it hard to light the set well, because as you're moving past something that is slightly illuminated or darker you've got things like lasers flying past you or explosions that you're flying by. So you want to see that light travel as well as some subtlety and complexity. 360-degree animatics were prepared with more realistic lighting and contrast so that the foreground is more photographically true and you get a nice high level of realism."

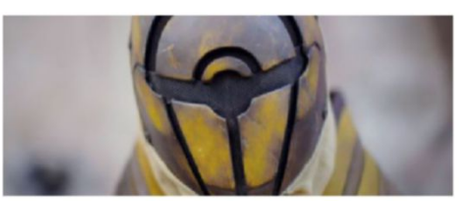
In a movie that's about the rebels stealing the Death Star plans, we're going to get a glimpse of that classic Larry Cuba graphic from A New Hope, John explains: "I did some investigations, and we couldn't locate a copy of the original film that was projected on the rear projection screen in that briefing room scene, so I did a painstaking recreation. It was fun trying to recreate older technology with the modern tools."

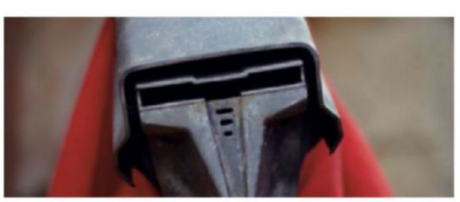
Six weeks of reshoots were conducted: "That was all about the movie coming in a bit long, condensing it, and needing to explain some of what had been dropped out. It was all about clarity and sharpness of storytelling," says John. "I'm deeply involved with the space battle right now and it's really fun. I like being able to revisit some of the old designs. There are a lot of classic ships that we are seeing in ways we haven't seen them before. The shots look gorgeous."

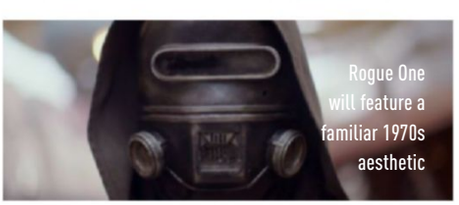
FYI *Rogue One: A Star Wars Story is in UK cinemas from December 15.*



Gareth Edwards hopes to deliver something quite different from what we have come to expect from Star Wars







Rogue One will feature a familiar 1970s aesthetic

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MAKING MOS EISLEY

How a team of Obsidian Entertainment artists recreated the famous Star Wars environment in Unreal Engine 4



"From a composition standpoint, we studied several scenes from Star Wars Episode IV and tried to mimic those as best we could while still working within the confines of a freely navigating real-time environment, but the main focus of the environment are the docking bays and the ships in them," says Jason Lewis, senior environment artist at Obsidian and lead artist on the Mos Eisley project

When a group of artists from game developer Obsidian Entertainment got together to create a personal project based around the Star Wars universe, it was always going to be something special. (You can download the UE4 experience from our Vault.)

"The project started out with wanting to build the most highly detailed real-time Millennium Falcon that anyone had ever seen," says Jason Lewis, who along with friend Terry Hess were the original artists on the project. "I am a huge Star Wars fan and I have always wanted to build a CG Falcon, but just never seemed to get around to doing it until now. It started out as a simple 3ds Max model, but then I thought it might be pretty neat to see it run in real time, and since I had no Unreal Engine 4 experience prior to this, I figured this could be a great project to learn UE4 with, so my goal was to build the most highly detailed real-time Falcon that anyone has ever seen, and I think I have pulled it off... except for maybe the Falcon model from the recent ILM X-Labs VR demo that was at GDC a couple months ago!"

But the idea spiralled. Why create a stunning rendition of the Millennium Falcon and not have a place for it to be shown of? "We then thought it would be neat if we put it into a game engine and have the ability to walk around it. Docking bay 94 was born."

Originally it was just going to be the Falcon sitting in Docking Bay 94, "so I could run around and look at it in real-time," says Terry. "Then I thought it would be neat to add the interior to the docking bay, and then some of the surrounding Mos Eisley city, then I thought, 'Hey, let's put the Mos Eisley Cantina in as well'. It was at this point that I realised the scope of this project had grown beyond my ability to finish it by myself."

As plans took shape to build the Millennium Falcon, docking bay and

a small portion of the city, Mos Eisley, it became apparent the scope of the project was too big for just two people. Jason Lewis and Terry Hess asked fellow artists at Obsidian Entertainment if they would be interested in helping create the scene and in the process familiarise themselves with Unreal Engine 4 in their spare time.

The response was overwhelming from the other Star Wars fans at the studio. "The Environment artists, prop artists, VFX and lighting artists as well as animation and QA, all ranging from junior to senior," says Terry.

Jason explains further: "Roles were determined based on the level of commitment people were willing to put into it. We had two project leads, four senior artists, five intermediate artists, one junior artist, two effects artists, one lighting artist, and two animators."



THE OTHER ARTISTS ALL CURRENTLY WORK FOR OBSIDIAN; THERE WERE SENIOR, MID-RANGE AND JUNIOR ARTISTS

Jason Lewis, lead artist, Obsidian Entertainment

other artists who worked with me on this project all currently work for Obsidian as well; there were senior artists, and mid-range and junior artists as well. We even had someone on the QA team contributing some artwork," says Jason.

"We had a total of 17 people contributing with varying experience and skill sets.

What began as a simple project to model the Millennium Falcon quickly grew into a complex interactive art piece: This recreation of one of Star Wars' most famous environments enables you to walk around its sandy alleyways in first-person. You can run around with a blaster, but the team were unable to enlist the help of any



The scene has a huge amount of assets which makes it really unique and immersive



THE TIE FIGHTER

Terry Hess explains how he created the signature starship of the Imperial fleet

"The Twin Ion Engine, or TIE Fighter, was originally only intended as a fly-over low-poly asset to help create movement in the environment. As it began to take shape, we quickly realised what an iconic shape the TIE fighter was and that it deserved more than a low-poly representation," explains Terry Hess, senior environment artist at Obsidian Entertainment, who was charged with creating the famous asset.

"The start, as with most assets, is to gather reference," says Terry. "I gathered images of primarily screenshots from A New Hope but it also included reference from the [scaled replica] EFX model. Scale and proportions are crucial for the balanced look of the TIE Fighter, most of the block out time was spent making sure these were correct."

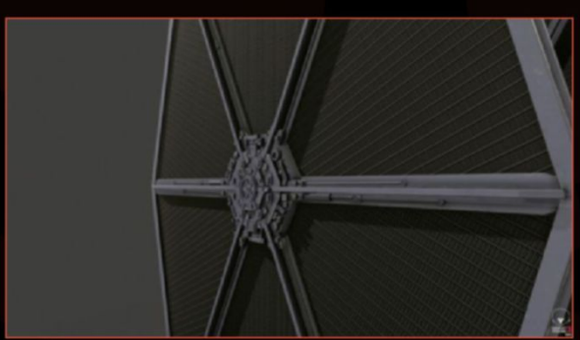
Standard box modelling in 3ds Max was used. "Originally it started as a 2,500-tri, low-poly asset. Details and chamfers were added until it ended up about 41,000 tris," he explains.

Terry says the asset has unique UVs for everything except the glass and solar panels of the wings, which were tileable. "It has a total of six materials, all at 4k resolution, except for the two 2k materials for the tiling parts. The materials were in Unreal Engine 4 with RGB packed texture for Roughness, Metalness and Ambient Occlusion," says Terry, explaining: "I feel the Roughness map is the most important of the maps and prefer to put it in the green channel, as the Green channel has one more bit of resolution than the red and blue channels."

When it came to texturing Terry turned to industry-standard Quixel Suite for the majority of the work, with some textures created in Substance Painter – for example, the end caps of the greeble elements.

"The TIE Fighter turned out to be a very solid asset. In total I spent about 80 hours on it. If I were to start over today, I would use Substance Painter for the majority of texture creation as I feel it has more control and tunability to the final resulting textures," says Terry. "Remember to nail down your scale and proportions first, it will save you a ton of time down the road."

Terry says if he were to create the signature starship again, he would use Substance Painter more than Quixel Suite



This model ended up at 41,000 tris after details and chamfers were added



The glass and solar panel on the TIE Fighter model used tileable textures



AUTHOR

Terry Hess
Terry is a senior artist in the video games industry and his credits include several Call of Duty titles and Battlefield 4.
www.terryhess.com

character artists, "so the only characters in the environment with you are a bunch of astromech droids and a few Gonk droids," says Jason.

Stay organised

Organising the team became a priority and it fell to the two founding members, Jason and Terry, to become project leads. The work was divided between two teams of artists each submitting models and concepts back to either Terry or Jason. One team managed the docking bays, all interior spaces, and the lighting; the second handled the exterior city. Work was then split up by interior and exterior, and then broken down by structures, vehicles and props.

Everything began with references notes, so early in the project Terry and Jason went through lots of Star Wars material, movies, games, books, and pulled out screenshots and descriptions of all the assets they wanted for our environment, and passed those out to the various artists.

"Since this was done in our free time, it was more of a free for all as to who would do what asset. People picked assets they were comfortable creating," says Terry.

Asset work was also divided into two lists, "the essential stuff", remembers Jason, "and the 'would be nice to have' list. Surprisingly we got through all the essentials, and almost all of the would be nice to haves as well."

A simple Word document was used to keep track of assets, references and work.



SURPRISINGLY WE GOT THROUGH ALL THE ESSENTIALS, AND ALMOST ALL OF THE 'WOULD BE NICE TO HAVES' AS WELL

Jason Lewis, lead artist, Obsidian Entertainment

New methods

One of the goals of the project was as an experiment to see just how much polygonal and texture detail could run on modern PC graphics hardware at acceptable frame rates. "As a result we are pushing some rather high-polygon counts and texture sizes. We are doing some modularity, but on a more macro scale.

Continued on page 38

CREATING THE DROIDS

These are the droids you're looking for! Matthew Carranza explains how he made the scene's highly detailed astromechs

In his day job Matthew Carranza is an environment artist, but for the Bay 94 project he was tasked with creating everyone's favourite droid, R2-D2 (as well as the one with the bad motivator, R5-D4).

For reference Matthew used a mixture of stills from A New Hope and photos of real, life-sized R2-D2 droids built by fans.

For modelling Matthew turned to 3ds Max 2013. "I start off any model by building out a high-poly model, and then making a low-poly model from the high," says the artist, adding: "The astromech droids are, at their core, a collection of simple shapes. That was my core thought process while making these guys. If a piece I was modelling started to feel a little too complex I knew I was going about making it all wrong, so I would scrap it and start over. This happened a lot."

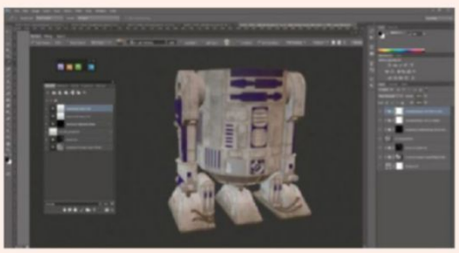
There are many pieces to the droids that look to be very intricate, but really are just simple shapes with cut lines, extrusions, insets and chamfers. "Right off the bat I knew I was going to be making the R2 and R5 units, so I decided early on that I was going to have three meshes to make the shared body and the different R2 and R5 heads. Luckily enough the only major difference between the R2 and R5 bodies was the colouring."

Matthew wanted these droids to be as movie-accurate as possible, "but at the same time I knew I was going to have to take artistic liberties with some of the pieces I couldn't get accurate reference for, so I wouldn't stress out on some detail that might not even be that noticeable."

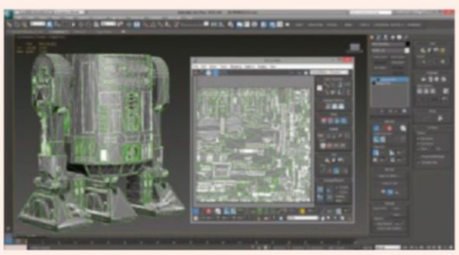
After two months of working on the droids in his spare time, Matthew turned to a program called IPackThat. "It did a great job at minimising my unused UV space. The body of the droid came out to around 18 per cent unused space, while the heads got down to about 26 per cent, which isn't bad considering all of the round UV islands."

For texturing Matthew used Quixel and says his workflow is pretty straightforward: "I start by uploading the low-poly model and the baked out normal map from either xNormal or 3ds Max and create a new project. I masked out areas where I wanted paint, metal, plastic pieces and threw some modified sandy grime over the whole piece. I tried working on both the heads and the body at the same to get them looking the same. I also made use of saving out my own custom material so I could use it on multiple projects."

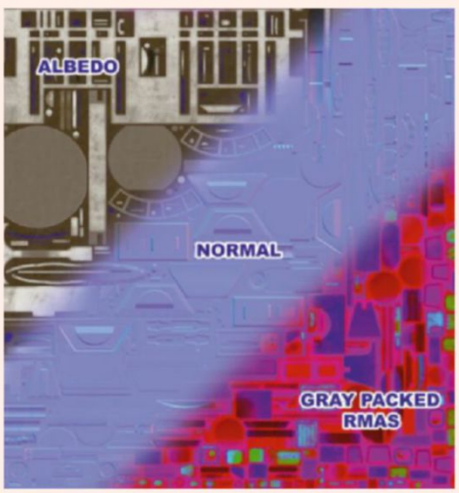
Once Quixel had done it's work, Matthew took his droid pieces into Unreal Engine 4 for some final adjustments to make the characters believable. "I did have to always keep in mind the kind of wear and tear these droids have on them," Matthew explains. "They exist on a dry, dirty and sandy planet, so the amount of grunge and grit on the droids should reflect that."



Quixel was used to mask out the paint and metal areas



The UV layout of the droid character



The same textures were used on the two droids to save time

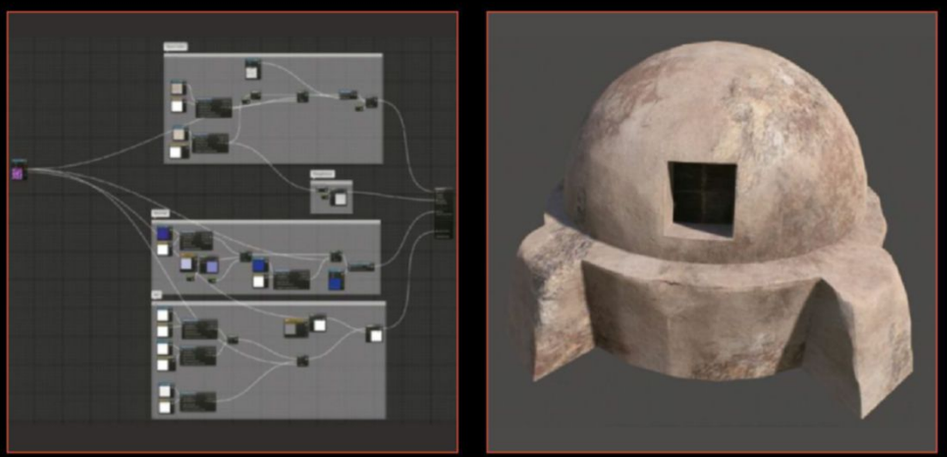
SAVING TIME WITH MATERIALS

The team worked in a different manner to handle UVs

To give the team more re-usability out of just a few meshes, a majority of the materials for the structures used world-space projection to save time with UVing.

"Some unique textures were combined in the shader with the tiling textures to give each building its own AO and Normal (some were sculpted in ZBrush), as well as a unique mask that allowed some te xtures to be blended in," says lighting artist Brian Leleux.

On top of the shader, numerous decals were placed to add even more variety to the buildings.



An overview of a dome material (left) and a dome in the Static Mesh Viewer with the material applied (right)

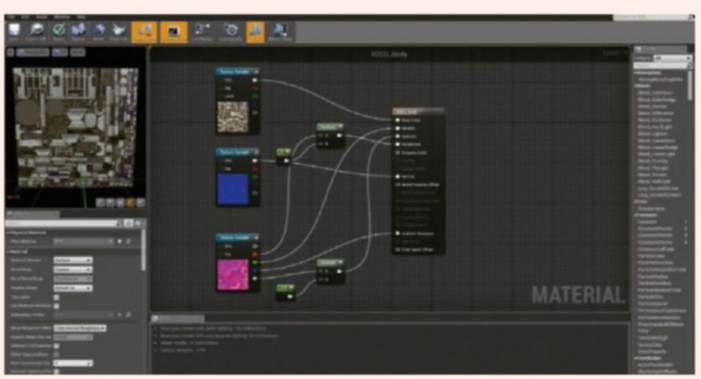


Matthew added dirt and grime to the droids to make them fit in the scene

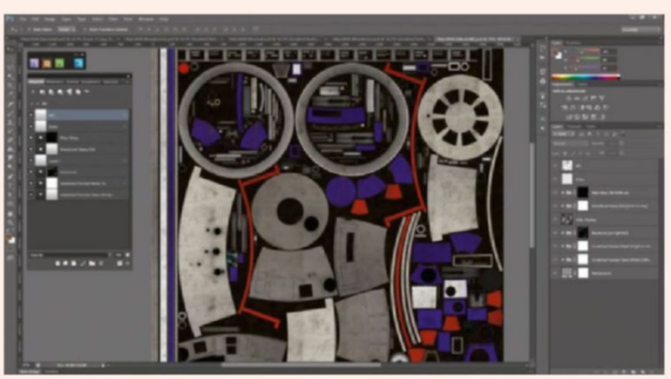


AUTHOR

Matthew Carranza
Matthew is a junior environment artist at Obsidian Entertainment. He has been with the studio for over two years.
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Unreal Engine was used to add some final adjustments, such as dirt and grime



With its 3D texture-painting workflow and texture-baking options, Quixel was handy



MAKING THE MILLENNIUM FALCON

Jason Lewis takes us through the creation of the centrepiece of this tech demo

The Millennium Falcon was the inspiration and centre piece of this tech demo. Jason Lewis, senior environment artist at Obsidian Entertainment and lead artist on the Mos Eisley project, had wanted to model the Millennium Falcon in order to explore it in Unreal Engine 4: "The whole project started with just building the Falcon as a real-time model, and then needing an environment to show it off in, then the project just grew from there," explains Jason.

Jason then put together a team to extend the environment beyond the docking bay. "The goal for the Falcon was to create one of the highest detail real-time models ever," continues Jason. "So going with that mentality I decided that high-end PC hardware would be needed to run it at smooth framerates, and surprisingly what we produced actually runs pretty well on even mid-range hardware."

The finished model took Jason eight months of working in his free time to complete; Jason estimates he spent 350 hours developing this one asset. "Overall I am quite happy with the end result of my real-time Falcon model," says Jason. "I feel I have succeeded in creating the most detailed real-time Falcon model ever."

In the next steps, Jason outlines his process for creating the famous Falcon...

> THE FIRST THING WAS TO BREAK UP THE ICONIC SHIP INTO SEVERAL PIECES, EACH WITH ITS OWN UNIQUE MATERIAL
>
> **Jason Lewis, lead artist, Obsidian Entertainment**



AUTHOR

Jason Lewis
Jason has worked in games for 21 years, at studios including EA, Zipper Interactive and currently he's senior environment artist at Obsidian Entertainment.
www.bit.ly/216-jason

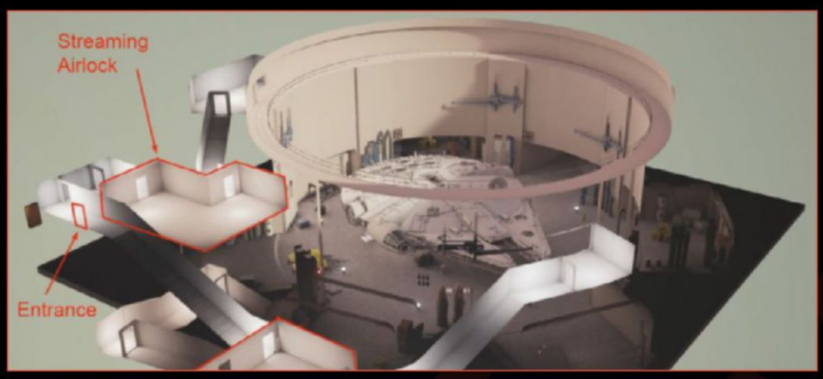
01 GATHER REFERENCE

The first step in creating the Falcon model was to gather as much good reference imagery as possible. I collected photos from the internet, as well as lots of screengrabs from the original movies. The basic forms and proportions were created using orthographic drawings from model kits (primarily the 1:72 scale Falcon kit from the Japanese company Fine Molds as it has the reputation for being one of the most screen-accurate model kits available).

02 MODELLING PROCESS

Modelling was pretty straight forward. Most of it was just following the reference imagery. The thing about the Millennium Falcon is that the entire ship is made up of relatively simple shapes, so it isn't really difficult to model. It's more a test of sheer will as it uses a significant amount of simple shapes to give the illusion of complexity. I made the decision early on that most of the details in the ship would be modelled as opposed to normal map details.





03 TESTING IN UNREAL ENGINE 4

Once modelling was finished, the asset was imported into Unreal 4 to test scale, collision, basic lighting, and proportions to make sure that everything looked correct from a human-scale, first-person perspective. The Falcon was the first asset brought into UE4, then from there I built out docking bay 94 and its interior, and then we started to add the city around it. It was here that I decided to expand the project far beyond its original scope and recruit more people to help finish it.

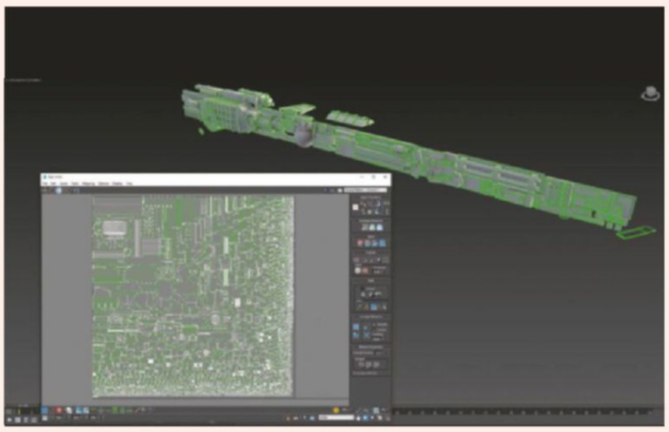
04 OPTIMISE THE PROCESS

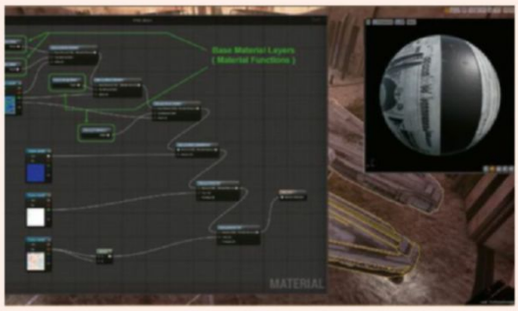
The original Docking Bay 94 interior was small and simple: a single hallway and staircase leading from the entrance of the bay, down to where the Falcon sits, but then I realised two things: once you got down to the Falcon there was no way to see the detail on top of the ship. I added a second hallway that led to an upper-level control room and had an upper-level ring around the entire circumference of the bay. Also, since we didn't make any LODs for our models, in order to keep frame rate up, we relied on lots of streaming of sections of the map in and out of visibility and memory. Since the Falcon was such a large system-intensive asset, we needed more time from when you enter the bay to stream the ship into memory, so I made the bay larger with some air-lock rooms to allow time for streaming.

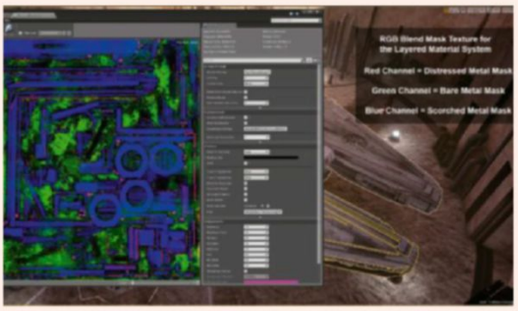


05 TEXTURING AND UVS

Once I got the Docking Bay interior sorted out, and got all the streaming triggers set up and working, it was time to move onto UVs and texturing for the Falcon. It took quite some time to decide how to approach texturing for the Falcon. So I broke the Falcon model up into several pieces (50 to be exact) each with its own unique 0-1 space UV layout. The problem was that since it was such a large asset, a normal diffuse/normal/spec texturing approach wouldn't work as texture resolutions would have to be very high to keep the texel density from turning to mush when the player got close to it. At that point I had heard a little about Unreal Engine 4's layered material system, so I did more research into the system and decided that it offered exactly what I needed for the Falcon, good distant fidelity combined with good texel density up close.





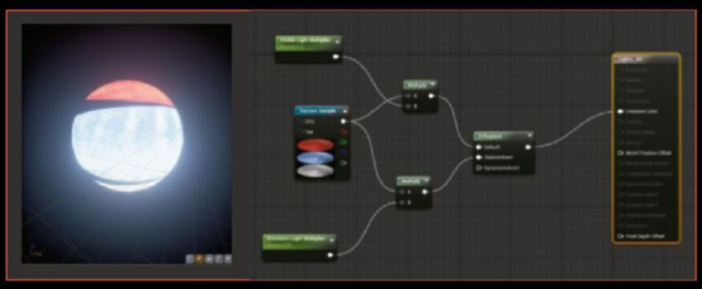


06 MODELLING PROCESS

So to put it simply, UE4's layered material system works like this, you first set up a library of tileable materials that represent your base surface types (they don't have to be tileable materials, but that is the real power of the layered material system in my opinion).

For the Falcon I had four base surfaces, base painted grey metal/distressed painted grey metal/bare metal/and stained, scorched metal. Those are then set up as material functions instead of standard materials, then for each piece of the Falcon, I gave it a unique material into which I inserted the base material functions and used greyscale masks that match each piece's 0-1 UV layout to blend between the different surface types. This allowed me to use one 4k grey-packed mask for each piece of the Falcon (four masks packed in the RGBA channels of a single image to define the four base materials), instead of using three 4k maps for each piece. In addition to the 4k mask, I also used a 1k normal map for each piece, as well as the 1k maps to define the base materials.

So, all in all, I was able to get good up-close texel density from the tiling base materials without it looking like tiled textures due to the high fidelity of the 4k mask textures.

07 IMPORT INTO UNREAL ENGINE 4

Once the texturing and material setup was finished, the final model was imported into UE4 and placed in Docking Bay 94. The final step was to light the Docking Bay interior and the Falcon. At this point our lighting artist had done a base pass on the overall lighting scheme for the entire level and all I had to do was the detail lighting in the bay itself. This included landing lights around the ship, down lighting from the lower saucer section, emitted light from the engines, several self-lit areas in the recessed parts of the ship and all the little navigational lights on the ship itself.

08 LIGHTING THE FALCON

Lighting was a pretty even split of placed lights in UE4 and emissive materials on the Falcon model. Most of the placed lights were static lights. I only used stationary lights where I really needed them, in places where I wanted the specular highlights and sharper real-time shadows. Emissive materials actually do a really good job of emitting baked lighting in a scene. I used the GI Replace node in the material editor to control emitted static lighting separately from the visible light on emissive materials so we could get really strong lighting in the lightmaps without causing the visible light to over-bloom.



09 POLISH AND CLEAN-UP

A bit of polish and clean-up of lightmap UVs on a few parts of the ship was next: animating the glow on the ship's engines (this was done with some sine and cosine nodes multiplied against each other and plugged into a multiplier that went into the emissive slot in the material), adding the steam particles to the ship, and adding a very simple cockpit to the interior to be seen from a distance only.

Buildings were instanced, the entire docking bay is reused three times in the level, some of the props are reused, but we are not doing much micro-level modularity," says Jason.

Because of the scale of the project the artists developed some new ways of working. "We developed several new pipelines that we will be using in our development day jobs," says Jason. "We came up with a prop asset pipeline that allowed us to build visually high-detail props very quickly utilising many newer art tools that have become popular over the last couple of years."

Most of the team are 3ds Max users, and the pipeline begins with building out the final low-poly mesh, then the high-ploy mesh is built for baking, "our high-poly meshes are typically only used to generate bevelled edges in our normal maps. Small micro normal map details are painted or sculpted in using ZBrush, Quixel, or Substance Painter," says Jason. Then it's time to bake Tangent Space Normal Maps/ AO Maps/and Curvature Maps; micro details are added to the normal, AO and curvature maps; and the final pass is done in Quixel Suite or Substance Painter.

"The workflow developed for the Millennium Falcon (read about this on page 34) has given us some good insight



High-poly meshes are used to generate bevelled edges in the normal maps

MODELLING AND TEXTURING THE LAMBDA

Thad Clevenger explains his process for creating the Imperial Shuttle

"My biggest challenge personally was that I wanted to make this shuttle as accurate to the original studio model as possible," says Obsidian artist Thad Clevenger. "So I spent a lot of time attempting to get every piece of greeble in the right place. I had to make up a few areas that I didn't have great reference for, but hopefully the hardcore fans will appreciate the attention to detail."

Was it worth it, we ask? "Looking back that might have been a bit of overkill, but it was a good lesson in studying the time and care that the original model makers put into their designs. I chose to create a high-poly mesh first and then bake down to a low. The positive of doing that is you can get a relatively low-poly model that looks much higher-poly than it is, however, the downside is it can take much longer to produce both models."

In his day job at Obsidian, Thad uses this same process to make extremely accurate tank models so he wanted to put that same process into action for the shuttle and test it to see where it can be developed.

"To texture my shuttle I strictly used Substance Painter. It was my first real attempt at texturing in Substance Painter and I wanted to to learn the software and integrate it into my workflow," says Thad. "Again, the goal here was to recreate the models they used in filming so I tried to match the look of the poster board and plastic from the original model."

The result was a matte finish, "Then I put a lot of dust and dirt on the model. I wanted it to look relatively taken care of, but still covered in some dirt and grime from regular use. I doubt the Empire would let their shuttles get too dirty," quips Thad.

"My advice when texturing vehicles in Substance Painter is to let the different materials build up just like they would in real life. By that I mean order the layers in the same order things appear in reality. So I always start with a base metal, then a coat of black primer, then the actual paint colour, then older stains, then dust and dirt, and finally newer stains."

"Once you establish things this way it is much easier to achieve natural-looking damage and scratches on your model. You can determine the depth of the scratch by whether it goes all the way to the metal or just reveals some of the primer beneath the paint."

Thad's last piece of advice: "While texturing with programs like Substance Painter or Quixel, never let the program do all of the work. They will get you very far in terms of where they place dirt and scratches, but it is easy to tell if someone put the extra time in to make their work look natural and custom-made."



AUTHOR

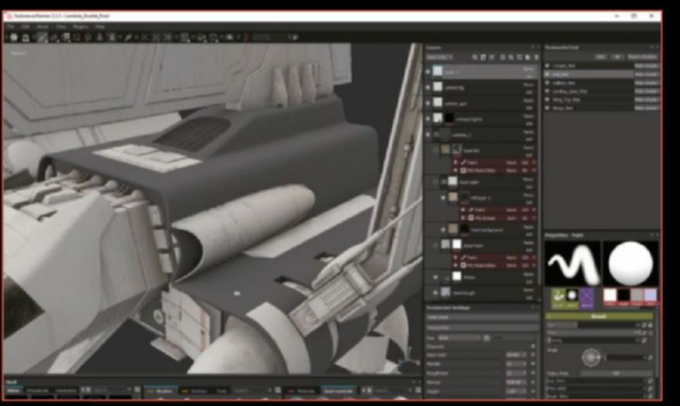
Thad Clevenger
3D artist Thad has worked in video games for over 15 years for Sony, Konami and currently Obsidian Entertainment.
www.thadclevenger.com





01 USE LAYERS

In Substance Painter I built up layers as they would occur in reality, with the layers building up from the bottom to the top. As you can see on this hull I started with the base metal material.



02 USE A PRIMER

After the metal I added a layer of dark primer paint. Doing things this way allowed me to have varying depths to my scratches. Deep scratches will show metal whereas shallow scratches might only reveal the primer beneath the paint.



03 ADD THE BASE COAT

The base paint went next, on top of the primer. It was important to add some colour variation to my paint, as paint generally will fade or slightly vary after some time. The next step was to add the dirt and dust on top of the paint.



04 USE THE PARTICLE BRUSH

I added carbon or dark streaks to the surface using the Particle brush in Substance Painter. This is a great way to get streaks that look random in a matter of seconds. I also put a layer above and below the dirt so that newer carbon built-up was above the dirt layer and older carbon was below the dirt layer.



05 FINESSING WITH DETAILS

I added oil leaks and stains as you see in this image of the landing gear. It is subtle, but there are some drops reflecting below the inner leg, as well as oil build-up on the moving parts. Try to make your damage make sense and tell a story. The brain will notice something is off if you just throw random scratches on everything.



to handling larger-scale assets for future projects," explains Jason. "Also, this was an Unreal Engine 4 learning experience for all of us, and that contributes directly to anyone who may go on to work on an Unreal based project in the future."

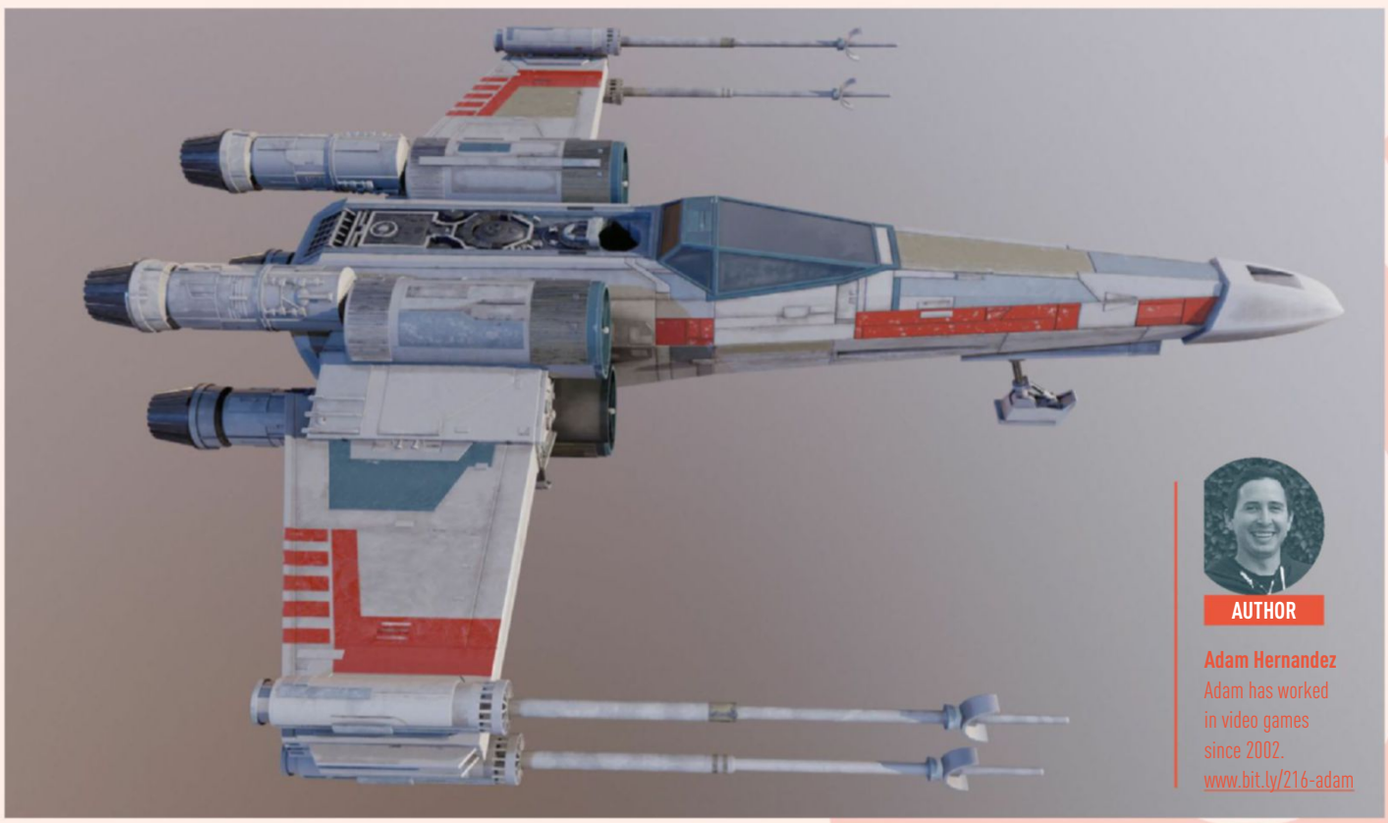
Material creation

When creating materials, work was based on the category its parent mesh fell into. Jason explains: "For buildings and structures we use tileable materials with worldspace-aligned textures. UE4's worldspace-aligned system works quite well and allowed us to create these assets faster by not having to spend a lot of time on intricate UVs that would have to be set up very carefully so as not to have lots of seams in the tiling. The world-space projection does a pretty good job of blending between curved surfaces, you do get an occasional seam here and there, but nothing horrible. The speed benefits far outweigh the random seam or projection glitch here and there. In addition to the tiled materials, everything is also blended against a global normal and AO map that defines the major shape and silhouette for each of the structures."



FOR THE BUILDINGS AND STRUCTURES WE USE TILEABLE MATERIALS WITH WORLDSPACE-ALIGNED TEXTURES

Jason Lewis, lead artist, Obsidian



AUTHOR

Adam Hernandez
Adam has worked in video games since 2002.
www.bit.ly/216-adam

BREAKING DOWN THE X-WING

Adam Hernandez takes us through his X-Wing process

Adam joined the team to get some practice working on hard surface models and using Zmodelling tools: "I started with a QCube for the body. In ZBrush, for pushing and pulling verts. I would isolate the verts I wanted to move by masking them, and then inverting the mask. Then using the transform tools, I could position them where I wanted."

Adam explains his Ztools process: "The Zmodelling brush is really nice. Assign it as your active brush, mouse over your active SubTool and press the spacebar, you'll be presented with all kinds of familiar poly-editing tools."

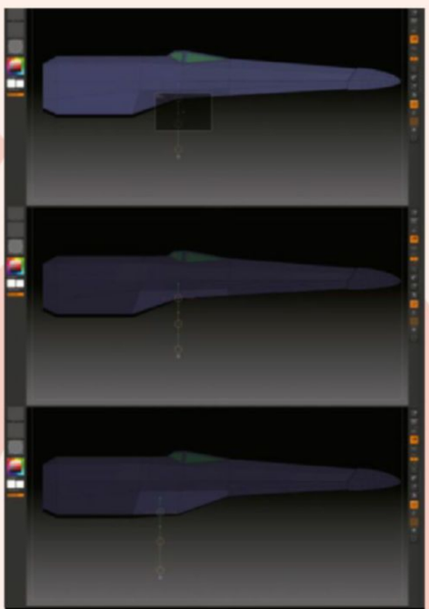
Adam then blocked in the body and used a second QCube for the wings, and a QCylinder for the engines and wing lasers. "The main goal of this stage is to get the silhouette and proportions locked down quickly," says Adam.

When Adam got to a point where he was happy with the blocking, he exported the model from ZBrush into 3ds Max for clean-up and detailing.

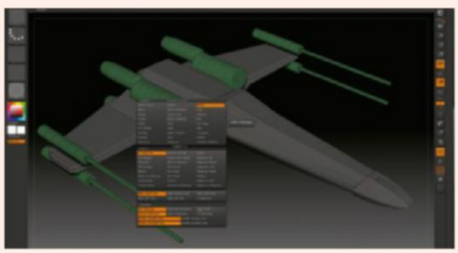
"The work in 3ds Max consisted of cutting in the panel lines and building out the surface details. I knew that I wanted my model to look turbo-smoothed, but it was going to need to be able to run in our real-time environment," says Adam. He also needed to consider how the X-Wing would work in the environment: "Since Jason's Falcon was running great in the scene at 700k verts, we knew that 350k for the X-Wing would be a nice target and allow us to place two of them in the rebel docking bay," says Adam. "To get the look I wanted, I needed to model the pieces out with a single smoothing group applied and cut in edge loops at the corners to get the bevels I wanted. Placing the edge loops closer or further from the corner controlled how tight the edge bevels looked. This gave me nice crisp edges, but without all the extra verts



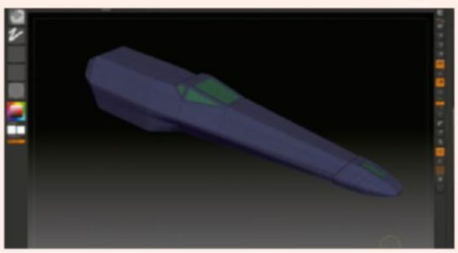
With lots of great reference material available, Adam knew the X-Wing would be a straightforward build, all he needed to do was stay true to it



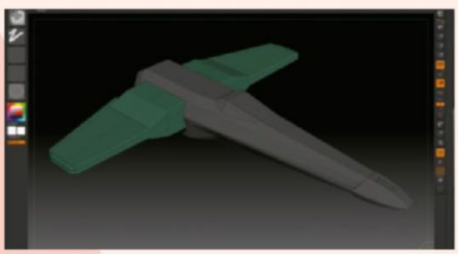
"Due to our project timeline, I didn't want to build something so high poly that I would then need to build a low poly to bake down to, I needed to do something in between," says Adam



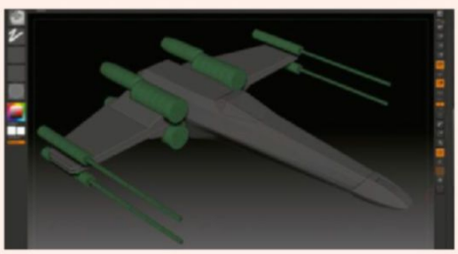
The ZModeling brush is a really useful tool



Adam blocked in the body of the X-Wing



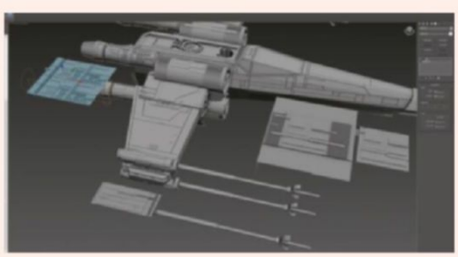
A QCube was used for the wings...



...and a QCylinder was added to create the wing lasers



Body panels were created with Max's Slice and Cut Face tools



Engine details needed the same look, but on a curved surface

of just using a Turbosmooth modifier. When I exported to Unreal, the model looked just as it did in 3ds Max."

To get the body panels Adam used a combination of 3ds Max's Slice and Cut Face tools. "Once I finished cutting in where all the panels would be, I pushed the body over to Maya and used the Bevel Face tool there to get nice and even panel lines. The detail on the body and wings of the X-Wing consists mostly of simple primitive shapes."

He used 3ds Max's AutoGrid function to align the surface details to the wing and body panels. "Then I cut in the extra edge loops and applied the single smoothing group. For a few of the more curved detail pieces on the top panel, I started with basic primitives and applied the Turbosmooth modifier set at 1 or 2 levels and deleted out any extra edge loops that I didn't need."

The engine details needed the same look, but on a curved surface. "To achieve this, I used a slightly modified variation of the process. I modelled them out as flat sheets, like the wings and body details, but used 3ds Max's Bend modifier to get the round cylinder shapes I needed. This required cutting in extra edge loops along the bending axis in order to allow everything to bend together nice and smoothly in unison," explains Adam.

UVs were done in 3ds Max, along with baking out a material ID map that used in Quixel Suite to assign my materials. Adam baked a base normal map, an AO map and a curvature map in XNormal which he then used as his base maps in Quixel.

Texturing was completed in Quixel, using nDo for adding additional normal details and 3Do for the metal, glass and various painted metals. "Having the baked maps from XNormal was helpful for getting wear, dirt and grime into my textures," reflects Adam.

The two big ships in the team's environment, the Millennium Falcon and the Imperial Lambada class shuttle, both use the layered material system. "I did do some early experimenting with using the layered system for smaller prop assets, but found the time to set it up and the additional GPU cost of using that system just didn't make sense for assets that are smaller than these hero set pieces," says Jason.

Prop assets used a simple material setup. "Your basic Diffuse map/Normal map/and a single grey-packed texture for Roughness, metalness, AO, and specular," says Jason. "We put multipliers in the shader for specular and roughness so we can tune the overall matt/shiny values of any surface without having to go back and re-author the textures. In addition we use a lot of emissive materials throughout the level which give nice pockets of bright colour and also complement the actual lighting as well."

Another material trick the team used a lot of is Unreal Engine 4's Flipbook node. "You can make an animated sprite texture atlas and then tell Flipbook how many rows and columns are in your atlas, and it will continuously scroll through those sprite frames and by plugging in a Multiply node, you can adjust the speed that the Flipbook plays back at," explains Jason, who says he used Flipbook for all of the animated lights on control panels and consoles.

When it came to creating textures, the team used Quixel for the most part as this is the standard used at Obsidian. But some artists used the time to experiment with Substance Painter; others created preset smart materials in Quixel that were shared with the team to speed up the workflow.

"I'd say our split is about 70 per cent Quixel and Substance textures, and about 30 per cent photo-sourced textures from the internet and personal collections," clarifies Jason. "Most of the tileable textures were the photo-sourced maps for things like



WE PUT MULTIPLIERS IN THE SHADER FOR SPECULAR AND ROUGHNESS SO WE CAN TUNE THE MATT/SHINY VALUES OF ANY SURFACE

Jason Lewis, lead artist, Obsidian Entertainment

BUILDING THE SCENE'S UNIQUE ASSETS

Matt McCorkell explains how creating additional props brought the scene to life

"I had the task of providing support and additional props for the Mos Eisley project," says environment artist Matt McCorkell, who was responsible for creating environment assets such as the satellite dishes.

"Considering that most shots of satellite dishes and communication towers were usually far in the background of shots, I decided to study some of the props from various ships in Star Wars. Then I started modelling out several dishes at once," says Matt. "After finding elements I liked and throwing out the ideas I didn't like, I started to detail the dishes to break up the large surfaces. I repeated this process over a couple of times until I found some designs that I wanted to model out."

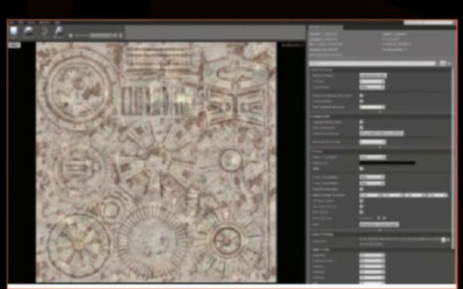
"While most detail was added along a radial alignment I found it more interesting to add details and modelled segments that broke up the direct symmetry of the dish itself. After all, in Mos Eisley not all supplies arrive in pristine detail and it's easy to imagine the patchwork designs that arise from the constant repair they may need."

This exploratory modelling took up the largest amount of time for Matt's prop work. "Once the low-poly model was finished it was time for UVs, which I packed as densely as possible (no overlapping UVs for AO, Normal and curvature map baking)," says Matt.

With his maps baked out of xNormal Matt then took them into Quixel and started



Matt researched the Star Wars ships to reference the style of satellite dishes used in the films



The preview window was used to check Albedo and roughness



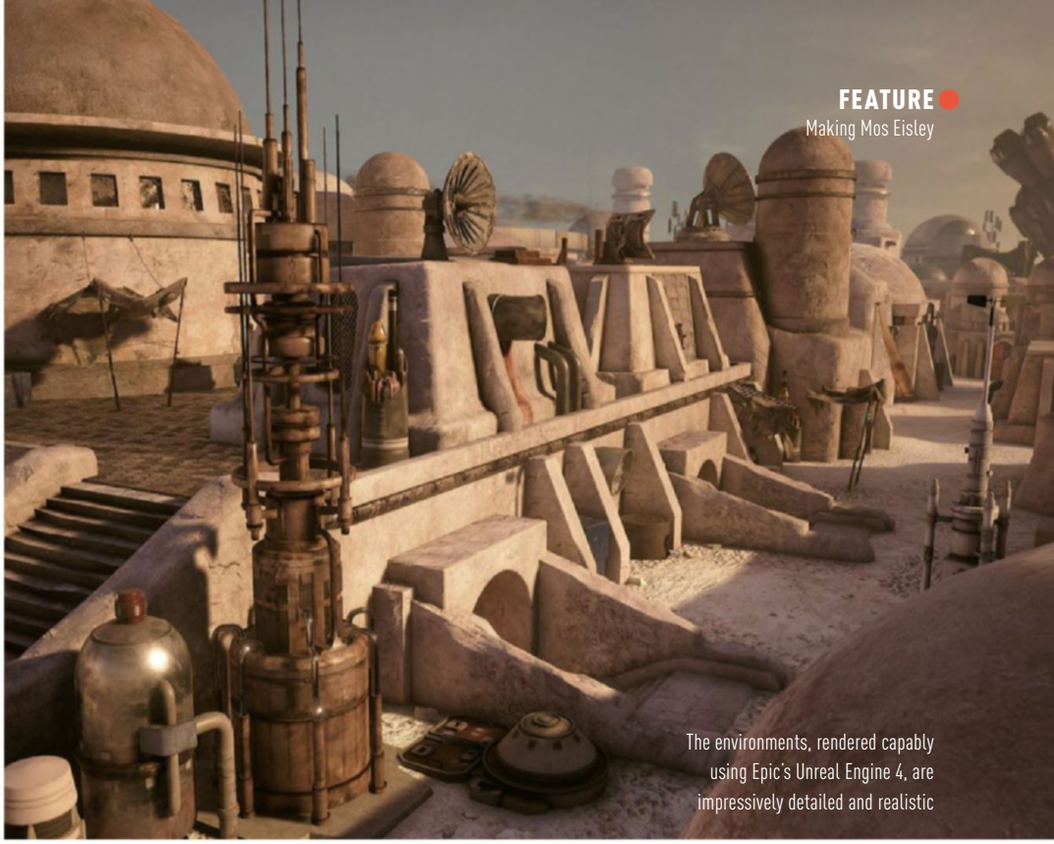
For consistency, different dishes were modelled at once

building walls and plaster, and dirt and sand terrain and ground textures."

Taking flight

When working on large personal projects like this, it can take time for the juggernaut to take shape.

"For a long time the project felt like it was stagnating a bit as people on the team were working on their assets on their own in 3ds Max and Maya, so nothing was making it into Unreal and the level in Unreal Engine 4 didn't change much for quite a while," remembers Jason. "Then it seemed like a bunch of people on the team all dropped finished assets all at once, and we ended up having the Falcon, Imperial Shuttle, many of the city buildings, two of the docking bay interiors, and a lot of props make it into the level all at once. We think that furthered people's motivation and it seemed like from that point on, we were



The environments, rendered capably using Epic's Unreal Engine 4, are impressively detailed and realistic

the process of creating a material for the satellite dish prop. "There are some nice smart material presets for metals within Quixel," he says, "but I find it best to use a smart material that's closest to the look you want. Then disable each of the submaterials except for the two bottom layers."

"Leverage quick masking based on the xNormal bakes and paint where you feel weathering should be heavier."

"Once you are comfortable with that first layer, work your way up adding additional materials where needed. It is critical to see how each material layer is affecting each of the material aspects. Use the preview window to check Albedo, metalness, and roughness separately in order to insure that material properties all have the effect you are trying to achieve. Once you have your maps looking good in view port be sure to try them out in UE4 as well."

The material setup for a small prop like this shouldn't take long to set up. "Pack Roughness, Metalness, and AO into a single texture by placing them within the RGB channels. These maps don't need any colour info so you can place them within different channels without losing any important info."

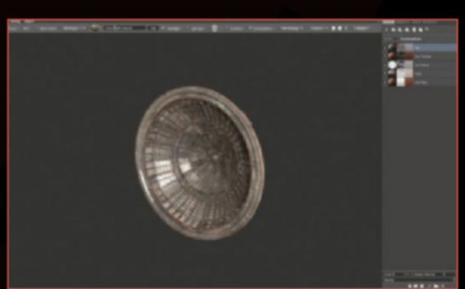


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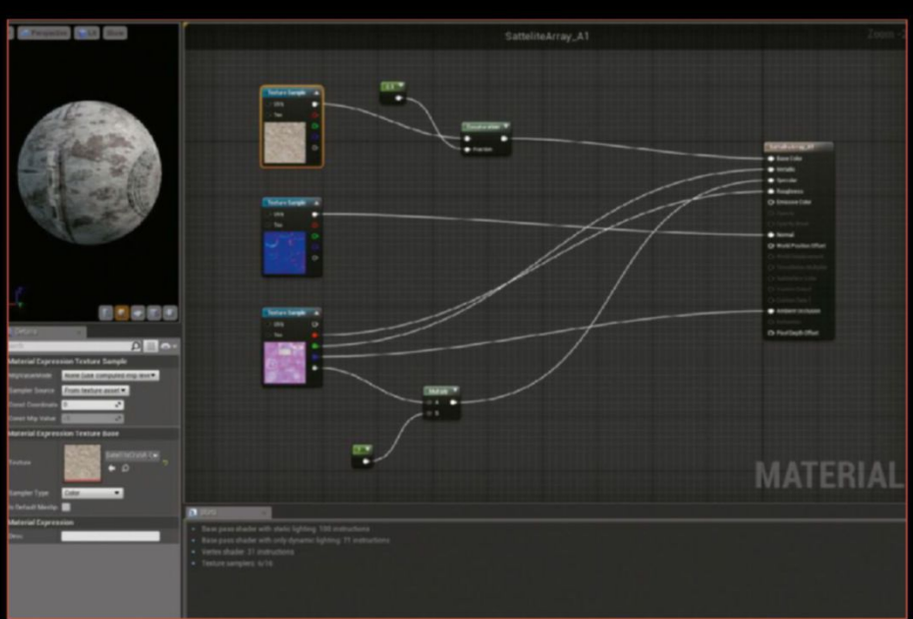
Matt McCorkell
Matt is an environment artist at Obsidian Entertainment.
www.bit.ly/216-matt



The RGB channels were used to create the textures



Here's Matt's Quixel material preview

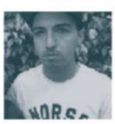


Matt's satellite dish material node map, as it appears in Unreal Engine 4



Immerse yourself in the sandy alleyways of Mos Eisley, download the UE4 experience from the Vault

getting things done at a quicker rate." It was a moment that was worth the wait and made the challenge of creating Mos Eisely in Unreal Engine 4 so rewarding. "We think the biggest challenge we had was simply finishing the project. Since it had grown to such a massive scope, and due to the fact that we were working on it in our free time, and learning Unreal 4 at the same time, it became an exercise in dedication to finish it without letting life and work events derail us from it," says Jason.



FOCUS ON THE PRIMARY ELEMENTS, FEEL IT OUT AS YOU GO, AND CONTINUE ADDING THE SMALLER FEATURES LATER ON

Brian Leleux, lighting artist, Obsidian Entertainment

When it comes to lessons learned, lighting artist Brian Leleux is clear: "Start off small," he says, adding: "Originally, this project wasn't going to be as big, but as more and more things came together, the motivation grew and new things were added. Focus on the primary elements, feel it out as you go and continue adding the smaller features later on. Find a balance between being able to learn something new and not burning out."

So what's next? "Several people on the team have Oculus and Vive VR kits," says Jason, "and we are currently working on learning the VR pipeline within UE4."

FYI *Download the Unreal Engine files from* **www.bit.ly/vault-216-starwars.**

MAKING THE E-11 BLASTER

Ken LeSaint, a 10 year game industry veteran, discusses creating the Stormtrooper rifle

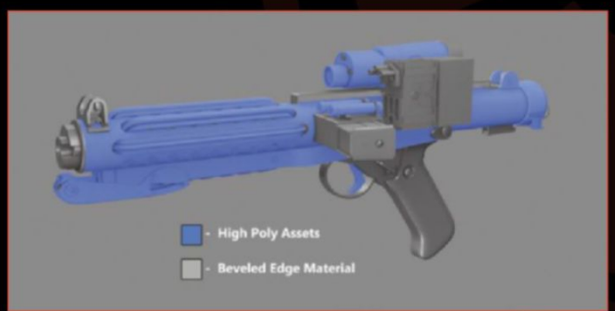
Adding an authentic Star Wars weapon into the scene came late in the day and the team turned to Ken LeSaint, senior artist at Obsidian Entertainment, to complete the task.

"Originally, we didn't plan on creating a Star Wars-themed gun to replace the stock Unreal first-person weapon, however, once things got further along, we noticed how great everything was starting to look and were encouraged to take things further. We decided at the very last minute to add an E-11 blaster to replace the stock weapon," says Ken LeSaint.

Ken created the model in 64 hours – including texturing – by modelling only 40 per cent of the high-poly pieces, while the other 60 per cent were simply low-poly pieces with an Architectural and Design Mental Ray shader applied.

"When rendered, the shader produces a bevelled edge effect on all 90-degree angles giving the appearance of a high-poly mesh," explains Ken. "By creating this pseudo high-poly, I then made a duplicate of the gun mesh and projected the pseudo high-poly details to a low-poly mesh, into a normal map, using a projection modifier and 3ds Max's texture baker."

Since this method tends to work best with sharp and boxy shapes, round and smooth curves are best to be modelled out as traditional high-poly elements, "I also used this method on several of the environment props which are scattered around the level," says Ken.



A mental ray shader was applied to give the appearance of a high-poly mesh





The E-11 Blaster replaces the stock Unreal first-person weapon

LIGHTING BREAKDOWN

Brian Leleux explains his lighting process

Mos Eisley is all baked lighting, with some dynamic shadows from the major light sources, explains Brian Leleux, lighting artist at Obsidian Entertainment: "I was not too happy with Light Projection Volumes, Distance Field GI, or Distance Field AO for this project, as they offered too little control or had too many visual artefacts at the time."

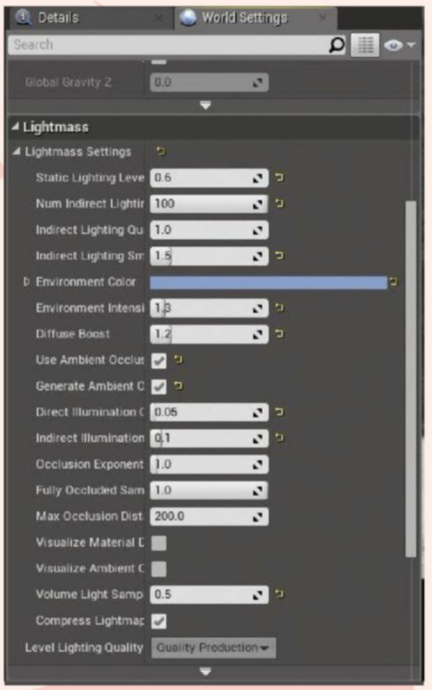
Brian says he generally starts lighting a scene using as few post-process effects as possible, "including no bloom, colour adjustments, or any major exposure tweaks. This allows me to focus solely on the lights themselves, while still seeing the diffuse textures and the original colours of the area I'm working in."

When lighting any scene, Brian starts with whatever the dominant light source is going to be. For exteriors this would be the sunlight and sky's light. For interiors it's whatever the primary light colour and shadow caster will be. "For Mos Eisley's interiors, it was all of the standard ceiling lights," says Brian.

"Once the primary lights are in place, I do a Medium or High build to see how everything bakes. Build times weren't much of a concern, so I used pretty high settings. Although adjusting the Static Lighting Level Scale breaks the 'physically correctness' of Lightmass calculations, the results are generally better looking in terms of quality," explains Brian.

Once completed, Brian looks at where he could potentially improve GI bounces to brighten the dark areas and increase visibility of the key ones. "When I am trying to increase bounce lighting, I like to place static lights that don't use the physically correct Inverse Squared Falloff or cast shadows," says Brian. "The Static light option removes all Specular contribution and the older falloff method gives me a little bit more control over the light falloff. The Specular is still picked up in cubemaps though, so the position of the lights and reflection actors can cause some problems with random specular hotspots."

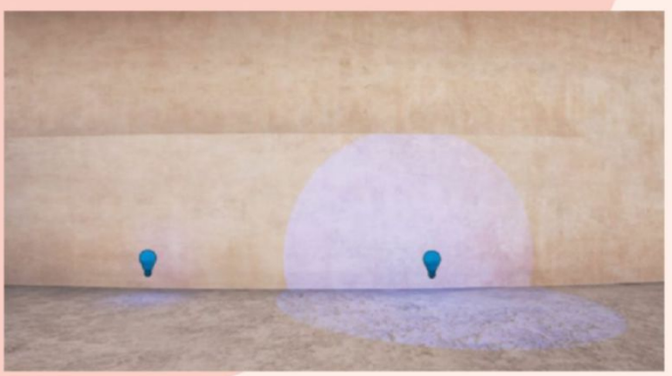
Once the area has been fleshed out, Brian incorporated the subtle features that helped ground the scene more. "Additional cubemaps, AO tweaks, colour grading, and other post-process tweaks are all made with this step," he says.



MENU SETTINGS Lightmass is the system responsible for calculating indirect lighting within UE4. Check out the Lightmass settings for the final build of Mos Eisley



LIGHTING TESTS "Base lighting in the test level, using only the Dominant Directional Light, Sky Light and simple post-process effect," says Brian



INCREASE COLOUR Bounce lights are placed around the scene to increase the colour from some of the saturated pieces. Light Falloff for bounce lights that have Use Inverse Squared Falloff unchecked. 16 (max) on left, 0.0001 (min) on right.





FINAL TWEAKS The medium quality bake with the hand-placed lights, but without post-process (left). The same settings, but post-process settings enabled. Depth of field, bloom, dirty lens texture, saturation and contrast tweaks (right)

Paul Johnson uses Autodesk's ART renderer to create famous droids, such as A New Hope's R2-D2. He explains: "I really love going to town on the weathering with R2; the dirtier the better!"



THE ART OF DROIDS

Self-taught artist **Paul Johnson** shares his droid renders and explains why Autodesk's ART renderer is perfect for astromechs

Self-taught artist and Star Wars fan, video game producer Paul Johnson has crafted a niche for himself amongst film fans with his series of Star Wars themed renders and projects.

"Like many in the entertainment industry a massive influence on me entering this field was Star Wars," says Paul. "I guess I was at the perfect age when the first film came out, seven years old, and it has been a big creative influence and inspiration ever since."

With each new Star Wars project, Paul has aimed to teach himself new techniques and hone his self-taught CG abilities. Modelling and rendering the droids from his favourite film franchise looked like a great way to improve his skills.

"Initially I did R2-D2 as I figured he is a cylinder with a half-dome on top, how hard can that be? I imagined it would be an easy introduction to modelling," explains Paul. "Well, as it turns out, R2 has a lot of hidden details. Once I started to research the droid I found that a significant amount of the modelling I had done was not accurate. That then started me on a cycle of madness that goes on to this day. With every new updated blueprint – the guys over at the R2Builders club have done an amazing job of researching and documenting every measurement and part – and render engine I move onto, R2 comes over with me and I update him."

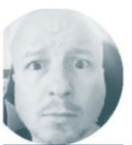
R2-D2 updates

Paul is quick to admit to his obsession with R2-D2. Each time the artist looks to test a new render software or update he pulls his model off the virtual shelf and gets to work.

"With each new render software update R2 comes along for the ride. On each of the new iterations, these new adjustments can be done fairly quickly as the majority of the workload is texture updates. Normally after a few hours, I can have whole 'new' R2-type droid as it is, for the better part, decal updates, a paint over."

While many turn to expensive renderers for their projects, as a hobbyist Paul needed something more affordable but which offered good results for finishing hard surfaces. He turned to the under-used ART (Autodesk Raytracer) inside 3ds Max 2017.

Paul explains: "As this started as a hobby and time is limited, due to work commitments, I wanted a render system ›



AUTHOR

Paul Johnson
Paul is a producer in the UK video games industry, and is a self-taught artist who creates Star Wars themed projects for fans and events.
www.pauljwiz.artstation.com

that takes very little setup and is easy to use. It has the added advantage of being a physical material system, which means I can continue to improve my workflow while also starting to look at other tools that support a PBR setup, which could help. In ART, I really like the shader functions. You can keep it simple or, if you wish, open up the advanced options and go as complex as you like or understand."

Paul's render setup is fairly simple. For the droid images on these pages Paul used three directional lights with HDR for reflections. "With ART, this is very quick and easy to get going with, and people should definitely play with the new Physical camera options," Paul suggests.



THERE IS DEFINITELY A STAR WARS STYLE, AND OF COURSE IT'S A SNAPSHOT OF ITS TIME AND TECHNOLOGY, BEFORE CG

Paul Johnson, video games producer

Paul has also learned to make better use of a post workflow, using Photoshop and After Effects. Before discovering this new ART, Photoshop, and After Effects workflow, Paul says, "I would spend hours going back and forth with the various render systems trying to get everything looking just right. This was back in the early, good old days when I was using mental ray, which led to hours of frustration trying to figure out workarounds and still not achieving a look I was completely happy with."

Complicated details

The Star Wars look Paul was aiming for in his renders is one familiar to all fans. "There is definitely a Star Wars style, and of course it's a snapshot of its time and technology. Before CG, filmmakers were building and filming real physical models, and all lit in the real world," says Paul. "They really packed an amazing amount of detail into each and every ship, droid or set, and, at the time, it was something we had not really seen before. Encompass this with the imperfections of the matte effects of the day and it's this that is the crux of creating a Star Wars style. Heavy contrasted, brightly lit ships, broken down droids and space stations that look like they could do with a good mopping; nothing is clean."

A further influence on Paul's passion projects are the behind-the-scenes photographs and footage from the making of the films that have emerged in the last few years as everyone craves more insights into how these classic movies were shot.

"I try to capture that 1970s film feel and look, and there is abundance of photographic material showing the models and other pieces in situ ready to be filmed or being filmed, so from that you can see how they were lit, their sizes and what distance the camera was from the model and so on, so as a starting point I try to recreate this in my setup as much as possible," says Paul.

WHAT IS AUTODESK RAYTRACER?

The new 3ds Max 2017 renderer proves useful

The Autodesk Raytracer, or ART, is a fast, physically based, CPU-only renderer first released with 3ds Max 2017.

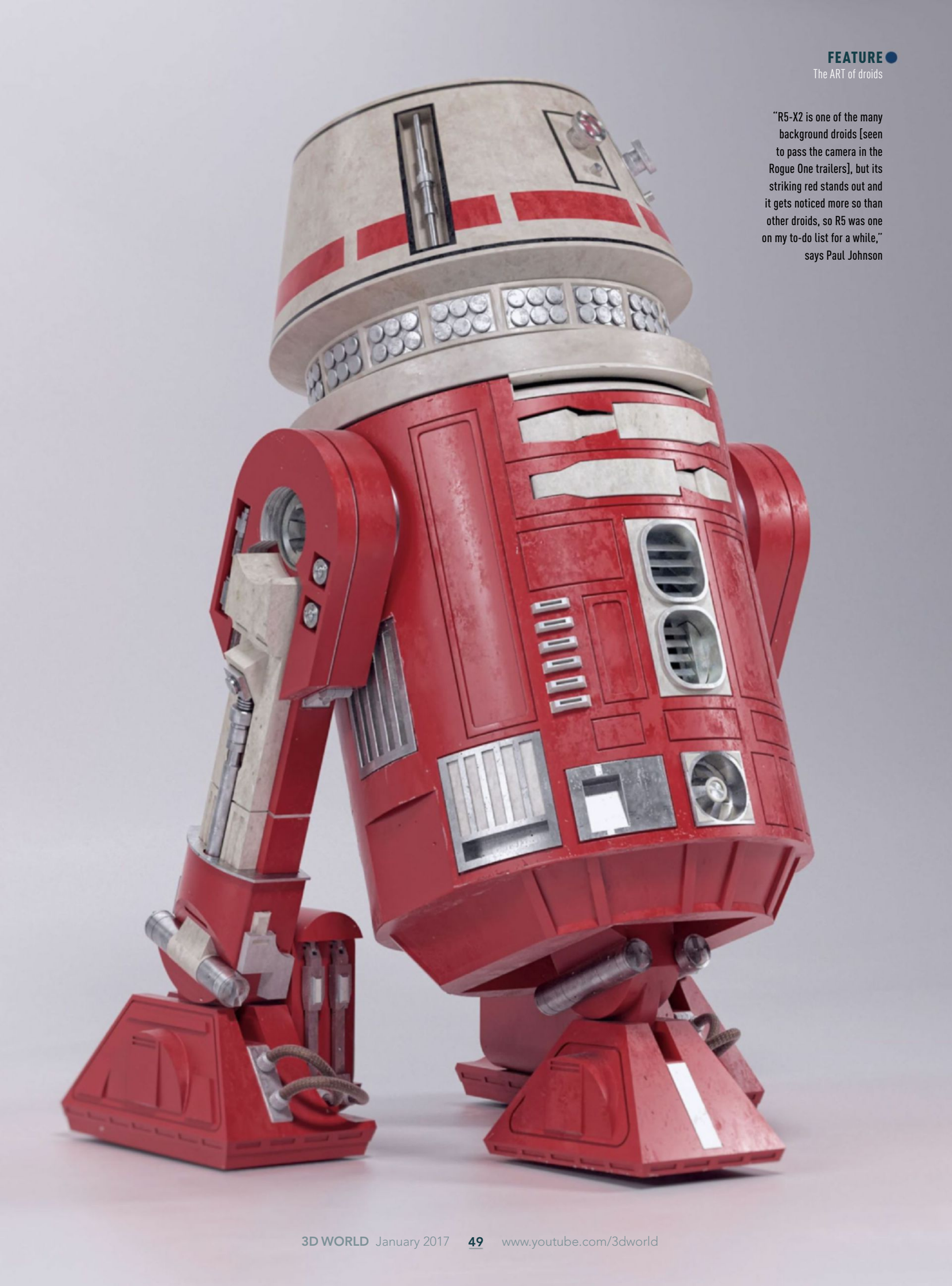
Aimed at design and arch-viz markets, the ART renderer has simple controls to make rendering physically based images easy and accessible. Aimed at beginners, but with enough options for pros, ART is a good option for anyone wanting fast, no-thrills renders.

As ART renders 'reality' it makes things simple, and turns out to be a great solution for rendering Star Wars droids – which are effectively large product renders.

Learn more about Autodesk's ART at **www.bit.ly/autodesk-art** and see how you can add this simple, intuitive renderer to your workflow.



ART is great for photoreal product renders, but can be adapted for other uses



"R5-X2 is one of the many background droids [seen to pass the camera in the Rogue One trailers], but its striking red stands out and it gets noticed more so than other droids, so R5 was one on my to-do list for a while," says Paul Johnson



Star Wars Rogue One's new R2-BHD astromech droid, as rendered by Paul Johnson. "R2 aluminium-based droids look great when they are painted; so having one left naked as it were is pleasingly odd and refreshing," says Paul

Paul has streamlined his ART render workflow to ensure he gets the relevant render layers needed to work in post more efficiently to achieve this Star Wars look.

Finishing touches

Photoshop was the go-to tool to finesse the final renders. "It saves me hours of adjusting within the renderer itself, there are lots of little corrections and additions I work up in Photoshop, such as noise removal, enhancing detail that wasn't evident in the raw render or quickly fixing any mapping errors, adjusting levels and exposure, adding colour grading, compositing, and various blur types," says Paul. "And sometimes, as well, there is my vain attempt at painting in additional details and backgrounds."

Paul says there is an abundance of fantastic photography plug-ins and software that are fully editable and have helped towards achieving the film look he's been after in his droid renders. "I did some research and playing around, and found a selection of tools that worked best with my workflow, this again saved valuable time in getting the desired look," he says. "I use the Google Nik Collection [**www.google.com/nikcollection**] primarily for sharpening and bringing out detail in my renders, and then I colour correct, grade and tone via curves. It has a great selection of editing tools, and lots of great presets to get you started."

> PHOTOSHOP SAVES ME HOURS OF ADJUSTING WITHIN THE RENDERER ITSELF. THERE ARE LOTS OF LITTLE CORRECTIONS AND ADDITIONS
>
> **Paul Johnson, video games producer**

Turning these references into an authentic-looking R2-D2 droid became a double-edged sword for Paul, both the most fun he'd had on the project and the most challenging. With so many references, across seven films, it became a puzzle.

"There are many versions of R2 across the trilogies, so I was going back and forth for much of this, one piece of reference from one film would contradict another, so I went with the elements I preferred," says Paul. "So I have a bit of a mix from across the movies, but for the better part R2 is based on the A New Hope version... oh wait, I forgot about the hell that was his blue paint on his panels, that was a joy to try and get looking right."

Ultimately this 'hell' was the most rewarding part of the project for the artist. "This is the fun part," explains Paul. "Adding the imperfections and weathering, not just in the textures, but on the model itself by adding misalignments to the geometry, damaged pieces and things like that. The real droid was made by a bunch of guys back in the 1970s who had no idea how big the film was going to be, so he was knocked together – brilliantly, I might add – and got knocked about considerably, which all added to his character."

Paul hasn't stopped at his favourite droid R2-D2, however, his collection of renders now extends to a number of astromechs from Star Wars: Rogue One, including R5-SK1, R2-BHD and C5-B5.

So what's next for the Star Wars obsessed artist? "I am working on a BB-8 droid, so maybe one day he will take over from R2-D2... did I just say that?"

FYI *Discover more droid renders at* **www.pauljwiz.artstation.com**



Paul's Tantive IV background from A New Hope was created in 3ds Max 2017



STAR WARS KIT-BASHING

Ansel Hsiao shares his process to add hull panels and details to a Star Wars themed spaceship using 3ds Max

With the imminent release of Rogue One: A Star Wars Story, and Industrial Light & Magic's use of old-fashioned kit-bashed models to recreate the tone of 1977's A New Hope, we turned to artist Ansel Hsiao this issue for his advice on how to get that Star Wars kit look in your CG.

"First you have to ask the question: what is it?" explains Ansel as we ask where to begin. "Real machines are typically built for a reason. Science fiction machines tend to be built for a look. The best Star Wars design incorporates both elements; the 'used universe' aesthetic works because the vehicles it produces look like they could plausibly be used."

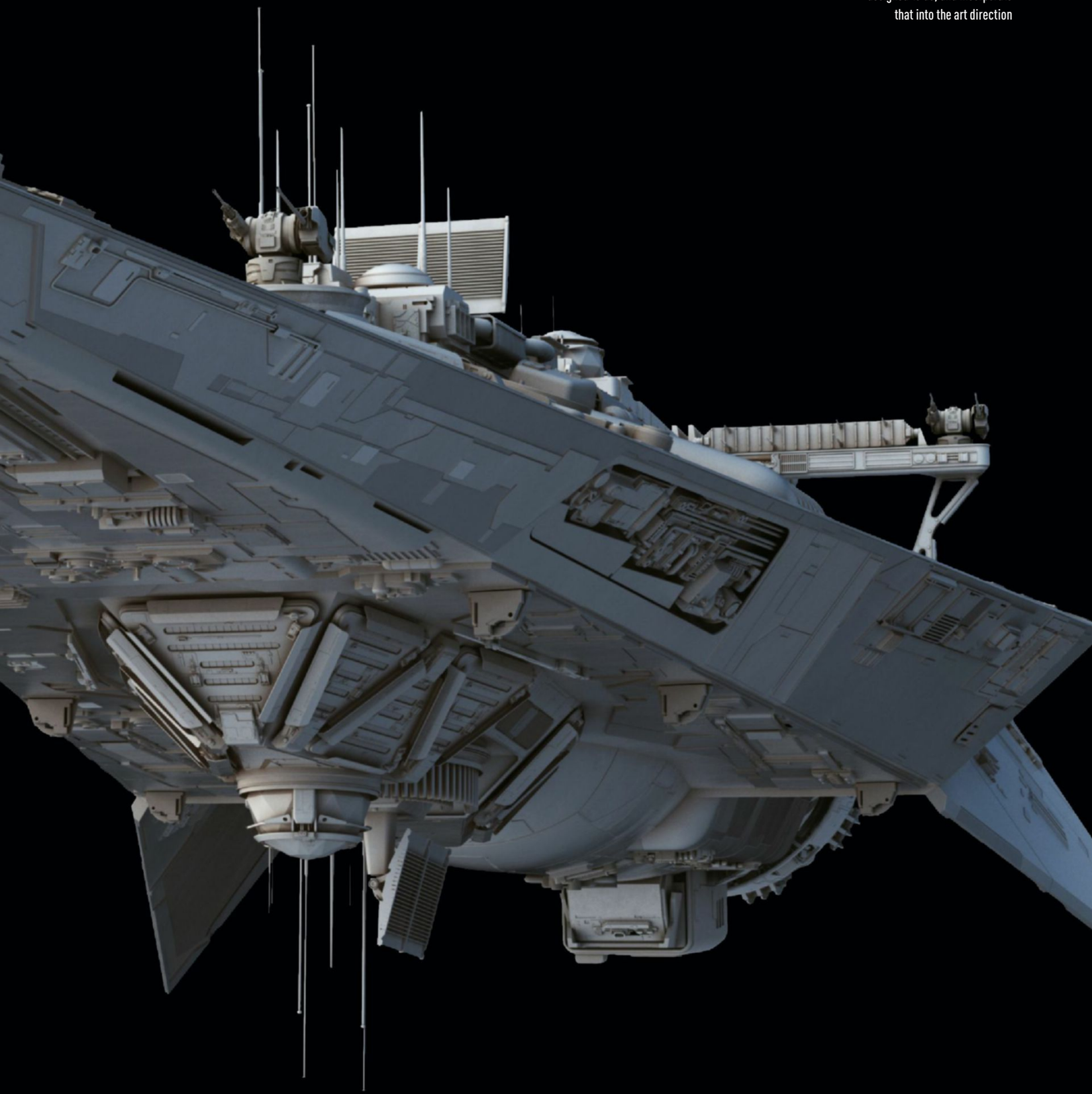
To capture that balance of use and imagination, Ansel recommends starting with an idea of what the vehicle or spaceship is designed to do and, "work those considerations within the overall art direction. After all, a freighter bristling with guns looks a bit weird." Ansel explains ›



AUTHOR

Ansel Hsaio
Ansel is a microbiologist and freelance 3D artist based in Saint Louis, Missouri.
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When creating a spaceship, Ansel believes it's important to keep in mind what it's actually designed to do, and incorporate that into the art direction



further: "Here, I wanted to capture the classic Imperial Star Destroyer look, but much smaller. The idea was for the ship to be a scout. So continuing to brainstorm the design, I gave it lots of sensors and antennae, and wanted to make it look fast and elusive."

Start at the base

Ansel begins creating the Star Destroyer variant with the basic hull shape. "The basic Galactic Empire aesthetic is based on relatively clean and geometrically regular shapes and sharp angles," he explains. "There are lots of complex surface details, but they should by and large conform to the basic shape." (Take a look at the boxout: Start with Basic Shapes, in order to see Ansel's step-by-step process for creating the base shape of his Star Destroyer).

THE BEST STAR WARS DESIGN INCORPORATES BOTH ELEMENTS; THE 'USED UNIVERSE' AESTHETIC WORKS BECAUSE THE VEHICLES IT PRODUCES LOOK LIKE THEY COULD PLAUSIBLY BE USED

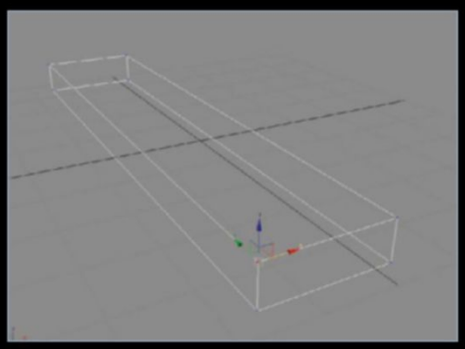
Ansel's process can be used to generate a basic hull shape very quickly, from which to develop the Star Destroyer. "Subdivision modelling can be used as well if you want to incorporate complex curves, but that's fairly rare for the Star Destroyer aesthetic," he adds.

Once your basic shape is finished it's time to start adding the "fun part," all those small details and elements that bring the model to life and help sell the used, authentic look needed for imagined vehicles.

"All Star Wars ships have hull and armour plates," states Ansel, explaining: "These can certainly be done with textures using displacement mapping and other techniques, but sometimes geometry is required. I'm going to show some methods for generating these complex

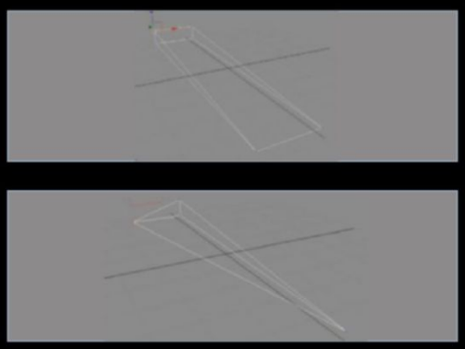
START WITH BASIC SHAPES

Make the basic wedge or dagger hull made famous by the Star Destroyer



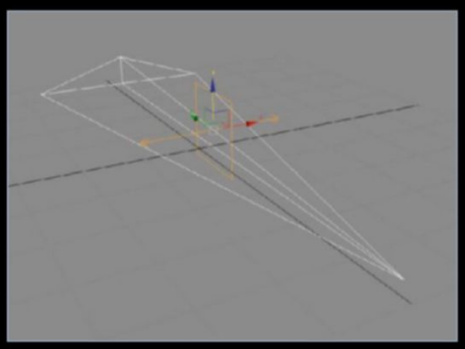
01 GETTING STARTED

By beginning with a box object, this will enable me to create the basic shape of the Star Destroyer.



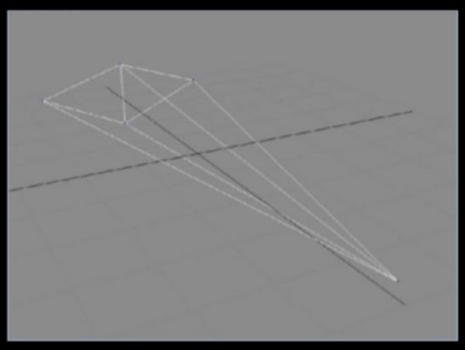
02 CREATE THE HALF-WEDGE SHAPE

I am now going to apply an Edit Poly modifier, then weld vertices in order to get the basic half-wedge shape.



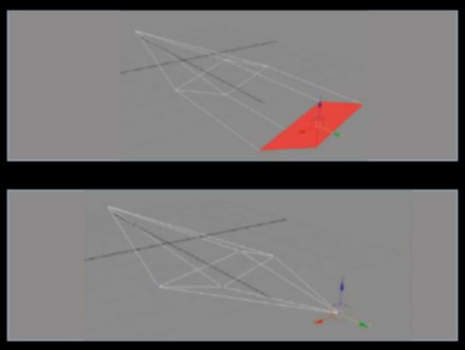
03 APPLY A SYMMETRY MODIFIER

Using Symmetry I am able to complete the basic shape quickly. Once half of the hull is complete, I apply a Symmetry modifier to finish the basic hull object.



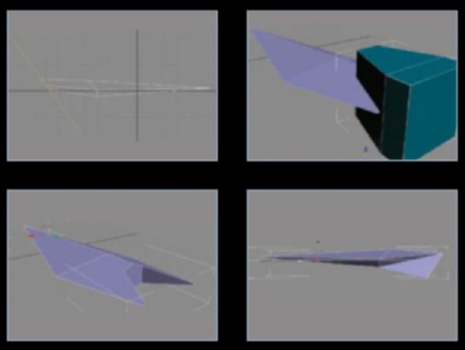
04 MAKE ADJUSTMENTS

Next I position the resulting vertices to match my desired hull profile and plan. This is a good time to make any last proportion adjustments by moving the corner vertices.



05 EXTENSIONS ON THE CORE SHAPE

Extrude a face, weld vertices to generate the basic wedge, then move the corners to shape. Once we change the basic geometry, maintaining planar surfaces becomes trickier, and affects how we add surface details.



06 FINISHING TOUCHES

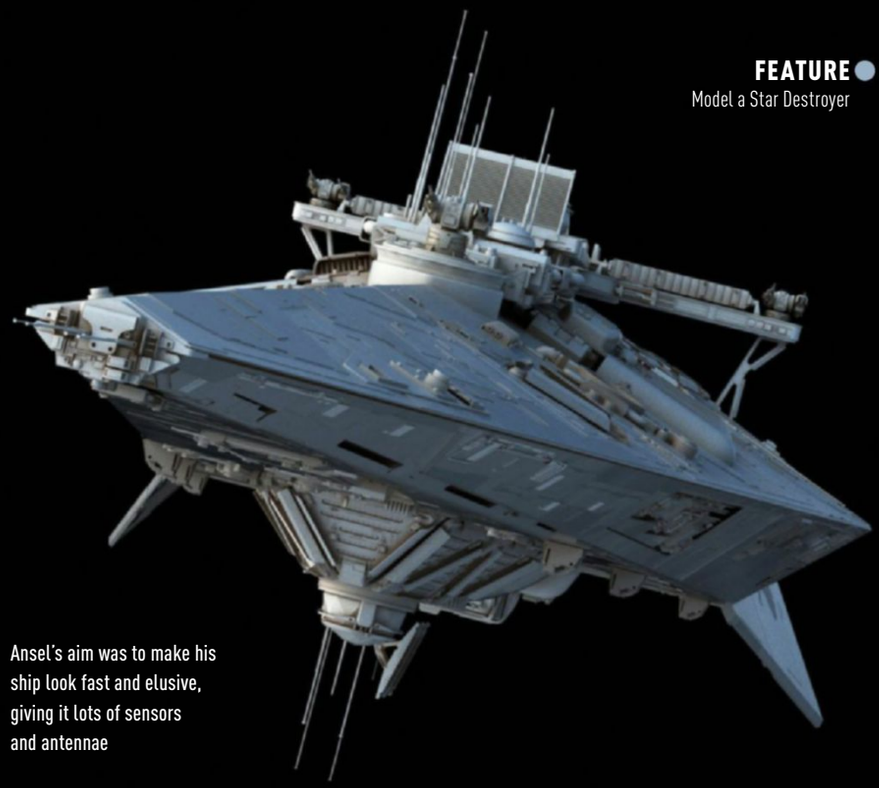
Use Slice Plane or Boolean operations to form the final outline and introduce new surfaces. Extensions to the basic shape, like wings, don't need to be all in one object; model separately and align against the main hull.

hull-hugging objects very efficiently." (See boxout: Creating Armour Plates to follow Ansel's steps to create hull armour details).

By following Ansel's steps you can generate a complex "field of hull plates" that the artist says is extremely time efficient, at the cost of some cleanup afterwards.

"Not great if you absolutely need quads for every object, but incomparably faster than modelling them via subdivision as a single object with the hull or individually against each hull surface," explains Ansel, before adding a warning: "The geometry clean-up required increases a lot for panels on compound curves made using this method."

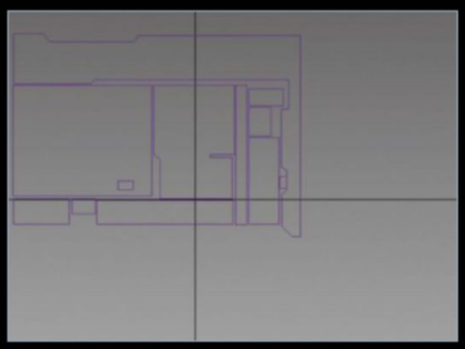
Ansel explains that another way to create complex hull details in geometry is to detach a surface that needs to be panelled, and then use Boolean



Ansel's aim was to make his ship look fast and elusive, giving it lots of sensors and antennae

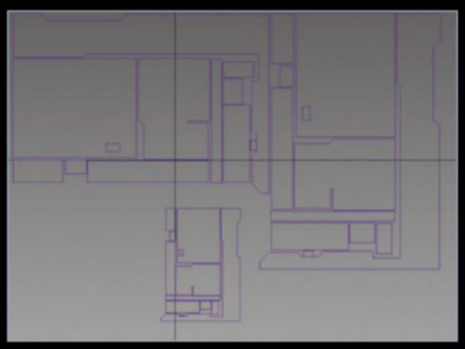
CREATING ARMOUR PLATES

Rather that using textures for detail, sometimes geometry can give better results



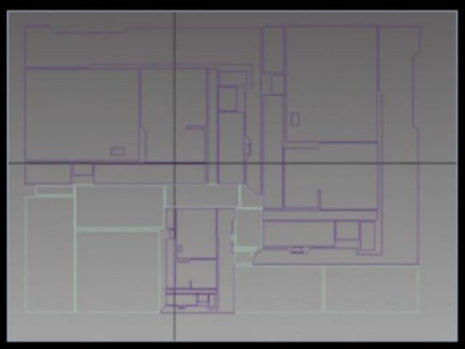
01 DESIGN YOUR PATTERN

Using splines, draw each plate and arrange them as you need to. Don't worry too much about perfect alignment of the plates. Try to introduce interesting grids and patterns at this stage.



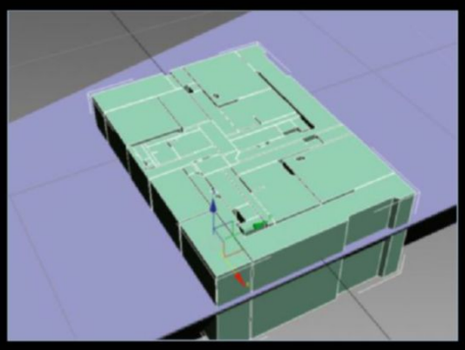
02 EXPERIMENT WITH YOUR PLATES

Clone, scale, and rotate basic combinations of plates to generate complexity. Remember that this process is iterative – the more scales and rotations you introduce, the richer the final pattern.



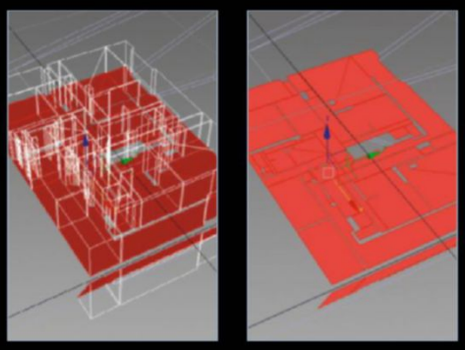
03 USE ADDITIONAL PLATES

Fill in the gaps between large cloned areas with additional plates, smaller than the base pattern – it links everything together. Aim to obscure the outlines of the smaller elements you created in Step 2.



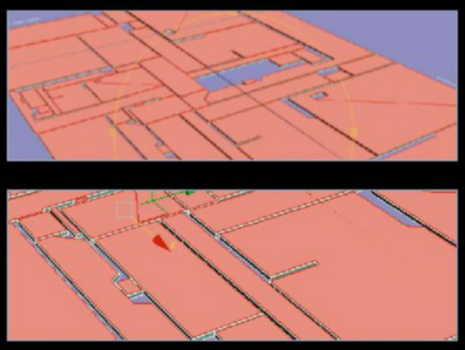
04 ATTACH SPLINES AND EXTRUDE

After attaching the splines, we need to extrude the final pattern. The pattern object can be rotated against the hull surface, or the hull can be moved to match. Objects don't have to align exactly but avoid complicated overlaps.



05 USE THE EDIT POLY MODIFIER

Use Boolean with the basic hull surface and the pattern. Apply Edit Poly modifier and that automatically selects the new faces generated. Delete the other faces (invert selection), and flip normals.



06 TIDY IT UP

Extrude, then bevel the faces or chamfer all edges (convert face selection to edge, grow selection once, then apply chamfer). Finally, clean up extra vertices.



Details on different levels from the base hull adds to the complexity

operations to cut out the final pattern. "The process is similar [to the boxout Creating Armour Plates], except that the starting spline pattern defines the gaps between the plates, rather than the plates themselves."

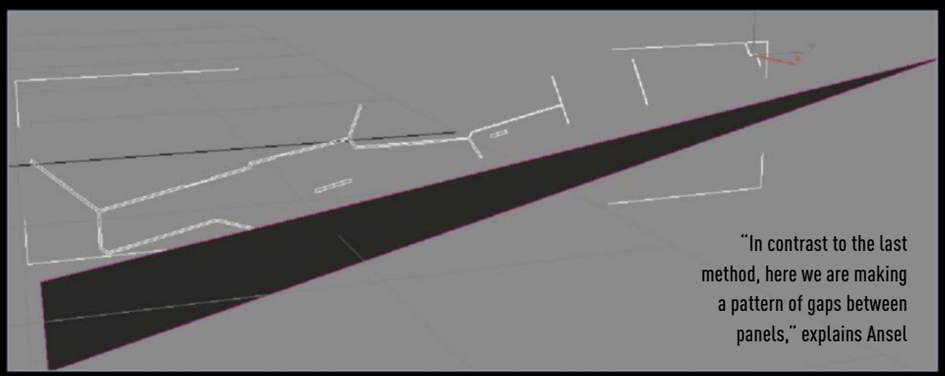
The final surface generated with Ansel's techniques is fairly monotonous, depending on the complexity of your starting pattern. "Since, if the surface was left totally flat it wouldn't give you much extra feel of detail than a displacement map, additional details should be layered onto the surface to increase complexity," says Ansel, explaining that individual panels can be detached and given different reflection or glossiness characteristics, "to catch your lighting rig differently and introduce some interesting variation to the pattern."

Ansel says you can also vary the height of the final extruded panels for more variation, "by insetting 'pits' of detail to introduce detail richness."

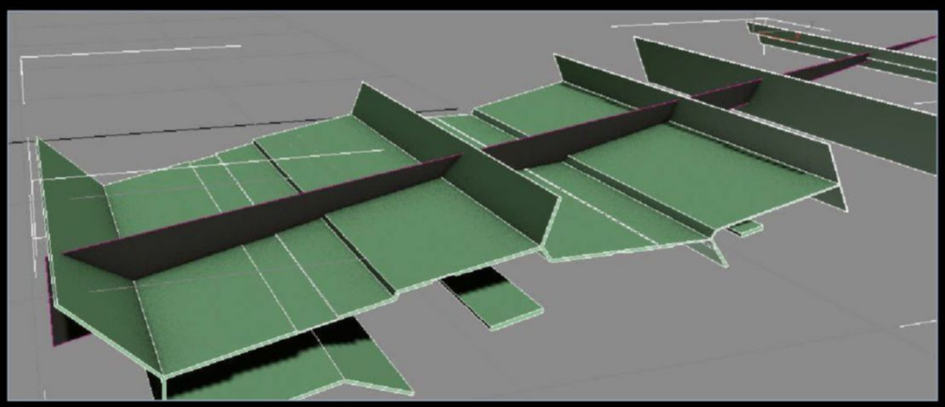
Adding variety

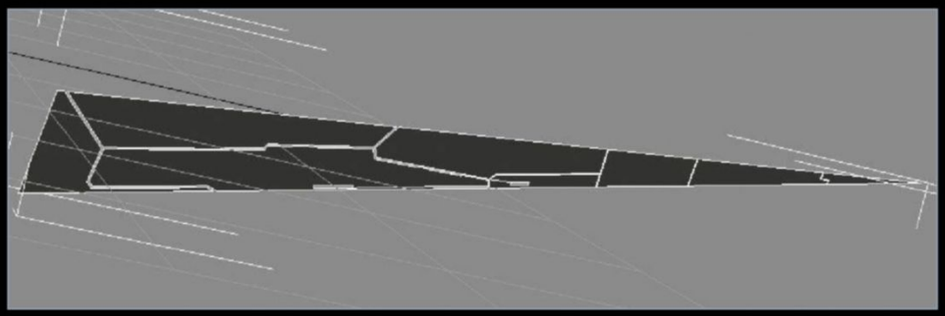
Ansel explains the next stage is to begin detailing by creating a stash of small, greebles, nurnies and detached equipment. It's best, he advises, to create a library of these at the beginning of any project.

Ansel explains: "Automotive, aeronautical and nautical equipment are good sources of



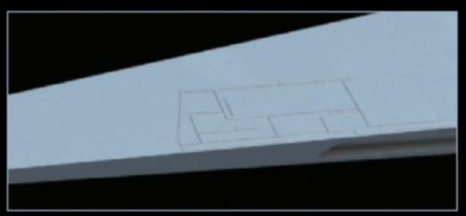
"In contrast to the last method, here we are making a pattern of gaps between panels," explains Ansel

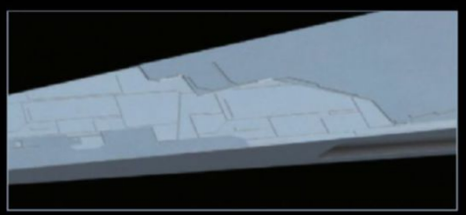


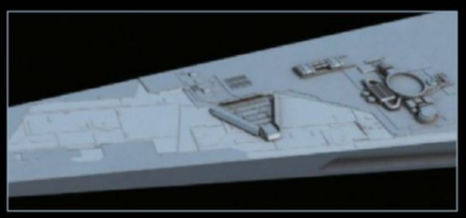




Panels can also be detached and given different reflection or glossiness characteristics











A strong outline is important for design integrity, but extensions and insets are great to add detail complexity

inspiration for these, as is the examination of plastic model kits. Remember that many Tamiya model kits died to bring us the parts for the studio models of the ships in the original Star Wars trilogy. Smaller bits of detail can be scaled, mirrored via symmetry, rotated, and combined to form larger pieces of detail."

The goal of creating these elements is to not have to model everything needed from scratch for every blank area of the ship that needs to be detailed. "Rather," explains Ansel, "you should be able to draw upon a large initial collection of pieces and rapidly and iteratively fill areas as needed. The more time spent building the initial detail library, the richer the final result and the quicker the assembly."

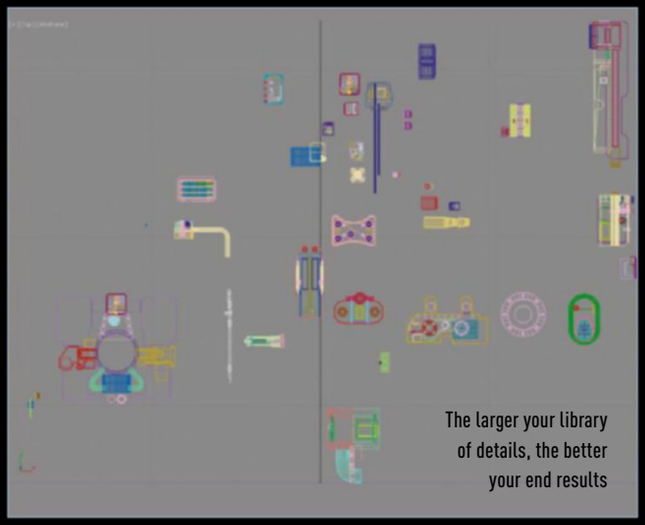
When placing these details, look to align them with the surfaces that need

DRAW UPON A LARGE INITIAL COLLECTION OF PIECES AND RAPIDLY AND ITERATIVELY FILL AREAS... THE MORE TIME SPENT BUILDING THE INITIAL DETAIL LIBRARY, THE RICHER THE FINAL RESULT

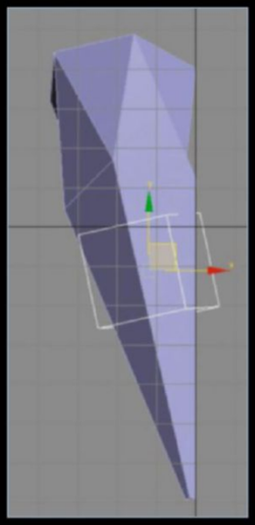
detailing: "I find that the process can be streamlined by aligning the surfaces that need to be detailed to the viewport cameras," identifies Ansel. "One quick way to do this is to link a dummy object to the hull. Align the hull face to the viewport, and then unlink the dummy. This dummy is a reference for the alignment required to make the hull surface aligned to viewport. Any time you need it set up again, align the hull object to the placeholder dummy object and you're ready to go again. Any plates or surface details linked to the hull will follow it as well."

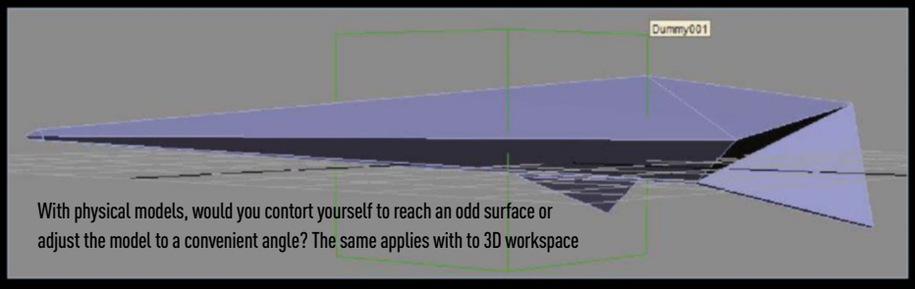
Remember, iteration is key: "These techniques can be repeated at smaller and smaller scales until the ship has the desired detail level. A panel can be given a smaller panel pattern, and a greeble can have scaled greebles attached to it. The sky is the limit!"

FYI *To see more of Ansel's work and process visit* **www.fractalsponge.net**



The larger your library of details, the better your end results





With physical models, would you contort yourself to reach an odd surface or adjust the model to a convenient angle? The same applies with to 3D workspace



"Iterate! Working in a CG medium means you're not limited to one detail pass,"



Terms and conditions: By entering you agree to be bound by these terms and the Competition Rules: www.futureplc.com/competition-rules. Entries must be submitted in .jpeg or .psd format (max size 10MB) by midnight (GMT) on 28 March 2017. Go to this link to submit entries: www.creativebloq.com/news/radeon-prorender. Late or incomplete entries will be disqualified. Entries are limited to one per individual. Open to all residents of UK, US (exc Rhode Island), Canada (exc Quebec), Australian and New Zealand who are 18 years and over, except employees of Future Publishing Limited and any party involved in the competition. One winner and three runners up will be selected by a panel of judges and notified by email. The judges' decision is final and no correspondence will be entered into. All entries will become the property of Future upon receipt and will not be returned. By entering the Competition, you grant Future and its licensees the right free of charge to republish your entry in any medium or format. You warrant that the entry is entirely your own work.

RADEON PRORENDER CHALLENGE

Do you have the talent to win a state-of-the-art workstation powered by the new Radeon Pro WX 7100 graphics card?

Radeon Technology Group are looking for the best CG artists in the world to champion its Radeon ProRender plugin*, for Autodesk 3ds Max and Autodesk Maya, and the winner will take home a new Armari workstation powered by the latest Radeon Pro WX 7100 GPU, worth $2,500. Five runners up will win a Radeon Pro WX 7100 graphics card. That's not the best news, the winner of the Radeon ProRender Challenge will become an ambassador for ProRender, the new physically-based rendering engine.

To enter the challenge you need to download a FREE copy of Radeon ProRender plugin for Autodesk 3ds Max **www.github.com/Radeon-ProRender/Max** or Autodesk Maya **www.github.com/Radeon-prorender/Maya/releases** and start creating. Radeon ProRender plug-in is made for designers, artists, and creatives, who want to make stunning renderings. It's a physically accurate raytracing plugin that can help you create photorealistic images with ease.

The entries will be judged by leading industry figures, and will include AMD's virtual production director James Knight, 3D World editor Ian Dean, and CG Channel's editor Jim Thacker.

Judges will consider the technical and creative merits of entries and how best artists have made use of ProRender. Each judge will select six entrants to be put forward to a shortlist, the most nominated candidate will win the first prize.

All entries will need to include breakdowns of their process as well as be resident in the United States of America, the United Kingdom, Australia, New Zealand and Canada. All themes of art will be considered but the winning entry should showcase the best results possible in ProRender.

CB CREATIVE BLOQ

RADEON PRO

RADEON PRORENDER

TO ENTER complete the entry form: www.creativebloq.com/news/radeon-prorender

THE DEADLINE FOR ENTRIES IS 28 MARCH 2017

ZBRUSH | KEYSHOT | PHOTOSHOP

MASTER THE ZBRUSH CONCEPT SCULPT PIPELINE

Riyahd Cassiem shares his process for creating this Darth Vader illustration using 3D and 2D techniques



AUTHOR

Riyahd Cassiem
Riyahd is a freelance digital artist who creates VFX, motion graphics, 3D characters, illustrations and concept art.
riyahdart.blogspot.com

Over the course of this tutorial I will go through some of my workflows and techniques for creating a 3D character illustration Using ZBrush, KeyShot and Photoshop. I will use a mixture of 2D digital painting and 3D sculpting techniques to create the illustration. The brief I received was to create a Star Wars Rogue One-themed illustration.

I started by gathering references from the Star Wars universe based on the brief. After compiling all the references and establishing the initial idea, I then create some concepts using 3D sculpting and digital painting techniques. I chose to focus on the new K-2SO droid and Darth Vader as my initial characters.

After receiving feedback from the editor, who chose the Darth Vader concept, I proceeded and started to refine the concept and jump into sculpting. The initial design is used as a guide to work from. Most of the work regarding the overall design, form and values of the character are solved during the concept phase. The bulk of the time is spent refining those forms and details using the various sculpting and posing tools in ZBrush.

After the sculpting stage is near completion. I use the KeyShot bridge feature to export my sculpt form ZBrush into KeyShot to establish the lighting, material setup and rendering. I switch between the two along the way. I apply materials and textures to different parts of the sculpt to help distinguish material differences and contrast in values of the character.

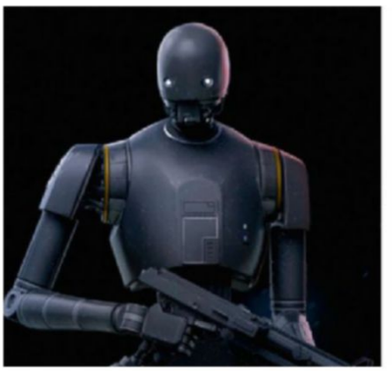
I experiment with various environment HDR light set-ups to create interesting contrasts in light and shadow. I then export the renders from KeyShot into Photoshop for post effects to enhance the final output for the character illustration.

This tutorial will cover the key phases of this process, hopefully you will find it useful.

DOWNLOAD YOUR RESOURCES
For all the assets you need go to
www.bit.ly/vault-216-starwars









01 RESEARCH THE STAR WARS UNIVERSE

I begin by researching the Star Wars universe. I draw reference from various sources, including sci-fi and fantasy covers as well as art nouveau and poster design. The references gathered help to guide the concept phase, to create a more cohesive design that fits into the Star Wars universe. I also keep in mind that the brief is based on the Rogue One story.

02 CONCEPTING DARTH VADER

I choose a few characters from the Star Wars reference images I've gathered and proceed to create concepts based on the brief. Starting off with thumbnail sketches, then using rough 3D sculpting in ZBrush, KeyShot for materials and lighting, as well as Photoshop for digital painting. The aim is to create mock-ups for the final rendition. I decide to create concepts based off the new K-2SO droid, and Darth Vader to submit for feedback.



03 CONCEPT SCULPT

In ZBrush, I select a sphere and start blocking out the character using sculpting and posing tools in combination with the DynaMesh function. I use the Transpose tool with the Lasso Selection and the Move brush to sculpt, the Clay brush to build and reduce forms and Dam standard for carving the surface. At this stage I focus on working out the overall shape and primary forms of the character, keeping the sculpt rough using large brush strokes. Then I work into the secondary forms with smaller strokes for added detail.

Inspiration

I chose Darth Vader because of his menacing iconic look, compelling character arc, with his struggle between the dark and light side of the force, and his predominance in the Star Wars universe.



04 FEEDBACK AND REFINEMENT

I proceed to refine the Darth Vader concept and jump into sculpting in more detail. The initial concept sculpt is used as a guide to work from. Most of the work regarding the overall design, form and values of the character are solved during the concept phase. The rest of my time is spent refining these forms and details using the various sculpting and posing tools in ZBrush, as highlighted in Step 03.



05 SEPARATING PARTS

I begin to separate the different parts of the character, such as the armour and gear, to sculpt on separately. I use the Paint and Lasso Selection tools to mask out certain areas of the mesh. Then I select the Group Visible function in the Masking menu (or press [Ctrl]+[W] to create a polygroup from the visible selection), this helps to add more detail to the different elements of the character when using subdivisions.



06 ADD DETAILS AND EXTRACT

I modify existing elements using Transpose and the Move brush. I now add the additional features to the character, like the gloves and shin guards. I use the Paint Selection tools to mask off an area of the mesh and the Extract function in the Subtool menu to extract these additional parts of the character. I experiment with the thickness slider in the Extract menu to get the desired results, before accepting the function.

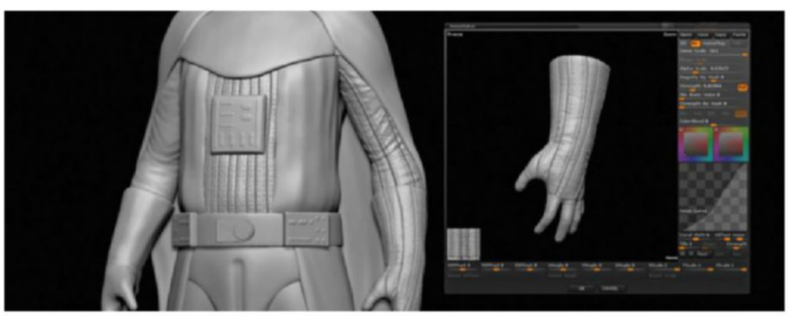


07 HELMET SCULPTING

After the overall shape and placement of the various elements of the character are set, I then work on Vader's helmet. I press [Ctrl]+[D] to add subdivisions, this creates more surface resolution to work with. I refine the shape and form of the helmet with the Move, Clay, Hard polish and Dam standard brushes. Having the helmet elements separated helps with control of the shapes when sculpting the helmet.

Vader's mask

To create some of the recessed sections of Darth Vader's famous mask, I use the Paint Mask selection and Inflate function.



08 CLOTH SCULPTING TECHNIQUES

I sculpt the cloth parts of the character using the Dam Standard brush, with the Smooth and Clay brushes used to create the cloth folds. Experiment with pressing the Alt key while sculpting, this creates an additive or subtraction form effect with the selected brush. After sculpting the folds I re-mesh the surface using the ZRemesher function and create UVs for mesh with the UV Master plugin. I then create a tileable surface texture in Photoshop and apply the image within the Surface Noise tab.



09 OVER SCULPTING

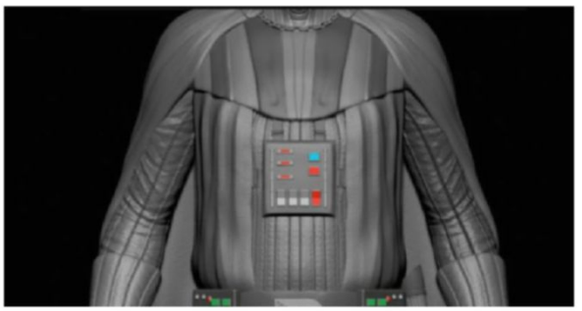
I continue to work back and forth between the different parts of the character. Refining the various features and developing the forms along the way, while using the references gathered as a guide. This workflow helps to manage the complexity of the character while working on the sculpt as a whole, and maintaining a cohesive design throughout.





10 ARMOUR SCULPT

I sculpt the armour parts, such as the chest and shoulder guards, using the Clay, Polish and Trim Dynamic brushes to create hard surface effects. I use the Dam standard brush to create the cut lines on the surface of Vader's uniform. I also use the Trim brushes to cut out angles or curves from the mesh. It is good practice to experiment with the various brushes and settings within ZBrush to get a feel for what the tools can do.



11 MODELLING THE ACCESSORIES

I approach sculpting the chest and belt features by using Insert Cylinder and Cubes brushes, in combination with the Dynamesh function and Cut tools. To create the various buttons and switches, I position and duplicate the repeated elements by selecting the Transpose tool and pressing Ctrl, while moving the selected object to create a duplicate. I also start to fill in the different elements with basic colours using the Fill Object function.

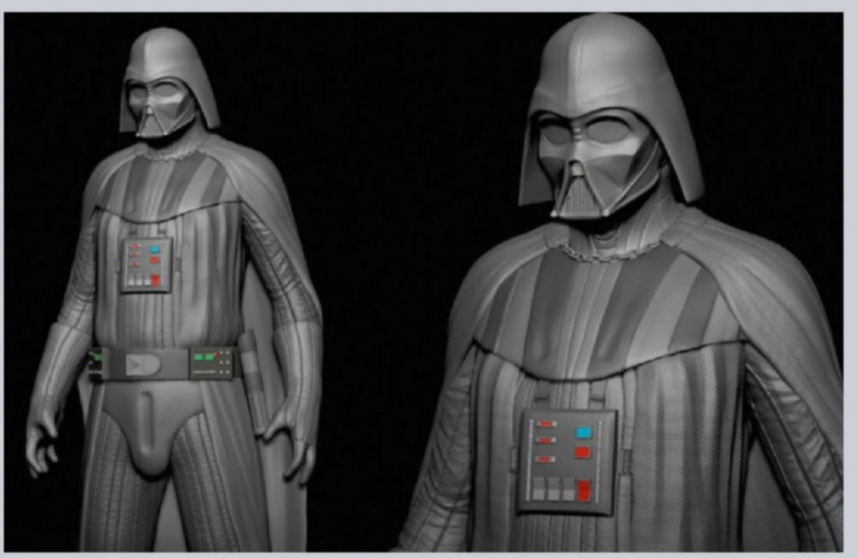


12 EXPERIMENT WITH VARIANTS

I create a helmet variation by duplicating the helmet and modifying the design slightly using the various sculpting and Transpose tools to shape the helmet. I create additional assets and modifications for the character as a variant design option. I decide to create a hood by duplicating the helmet mesh and use the Move, Clay, and Dam Standard brushes to sculpt in the cloth deformations. I may only take elements of this variant into the next phase of modelling, but it's good practice to keep refining your ideas as you go.

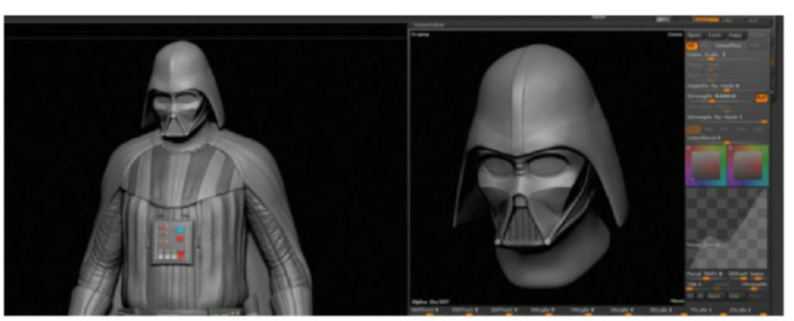
Noise Surface Texture

I create tileable image textures for the fabric pattern in Photoshop. These are based on references gathered at the start of the project. I use them in the Surface Noise feature in ZBrush. I experiment with different sliders to affect the strength and scale of the surface texture.



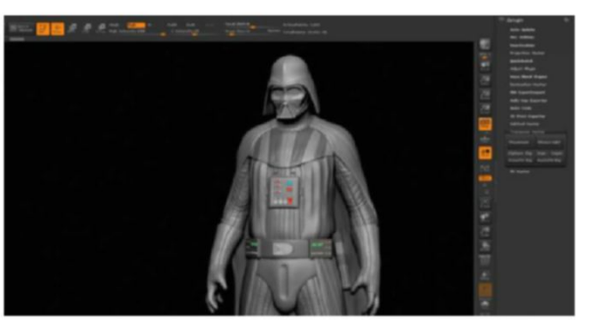
13 REFINEMENT

I spend more time refining the overall shapes and lines of the design with the Move brush to modifying proportions of the sculpt. The Smooth brush softens areas of the mesh. I use the Dam Standard brush with LazyMouse activated to refine the etched lines of the surfaces. I also use the Inflate slider in the Deformations tab with masked selections to created recessed surface details down the uniform.



14 SURFACE DETAILS

The sculpting details are complete so now I need to go through the various parts of the sculpt and prepare the character for posing. I merge and remesh some features using ZRemesher. I rename the meshes accordingly then apply colour values and materials to various elements of the design. I then apply surface details to parts of the character using Surface Noise and custom textures created in Photoshop.

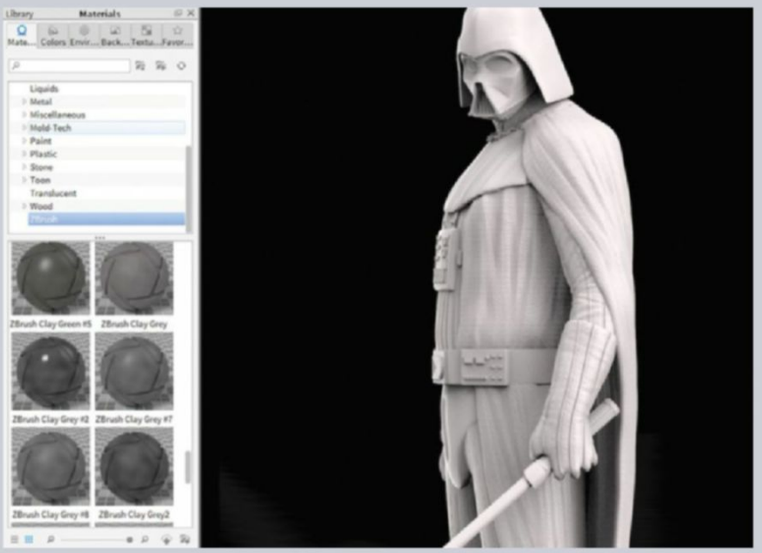


15 POSING THE MODEL

Using Transpose Master plugin in ZBrush, I pose the figure. Clicking TPoseMesh activates posing and merges all the subtools into one subtool. I use the different Polygroups to isolate mask selections and the Transpose tool to move or rotate the various parts of the character, testing out poses until I am satisfied with the result. After posing clicking the TPose Transfer button transfers the pose to the high resolution subtools.

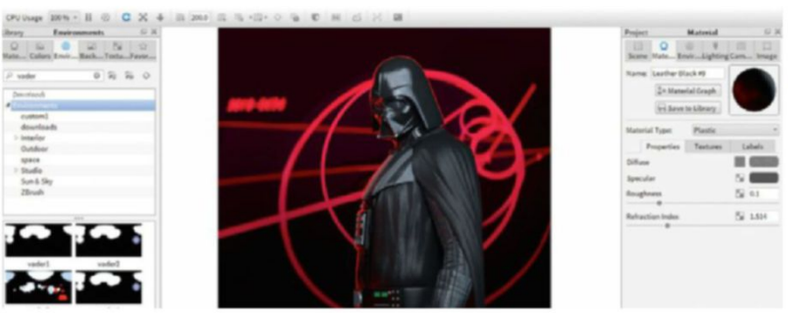
16 KEYSHOT SETTINGS

The KeyShot Bridge in ZBrush is used to transfer the sculpt from ZBrush into KeyShot for material setup, lighting, and rendering. In KeyShot I work out and visualise different materials, textures, and environment lighting setups for the character to render. I apply the materials by dragging a material from the Material tab onto the different parts of the model. The Environment tab works the same way. I also experiment with different materials and environment lighting setups to see what suits Darth Vader.



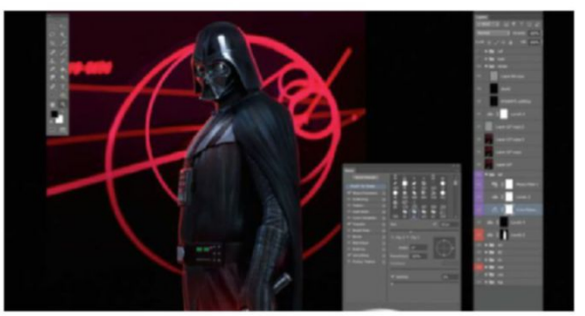
Backplate

I create custom image backgrounds in Photoshop using digital painting and image manipulation techniques.To be used as backplates in the Environment menu within Keyshot. This will enable you to test different backgrounds when lighting a scene.



17 LIGHTING THE MODEL

I explore various lighting set-ups with the HDR Environment tab, by selecting a thumbnail from the Environment menu and dragging it onto the background to apply the environment to the scene. I experiment with different lighting settings for Gamma, Brightness, and Contrast. I'm looking for a good balance of dark and light tones that compliment the design and background. Using the HDRI Editor create additional pin lights, I am able to highlight features of the character that will pick out Vader's form.

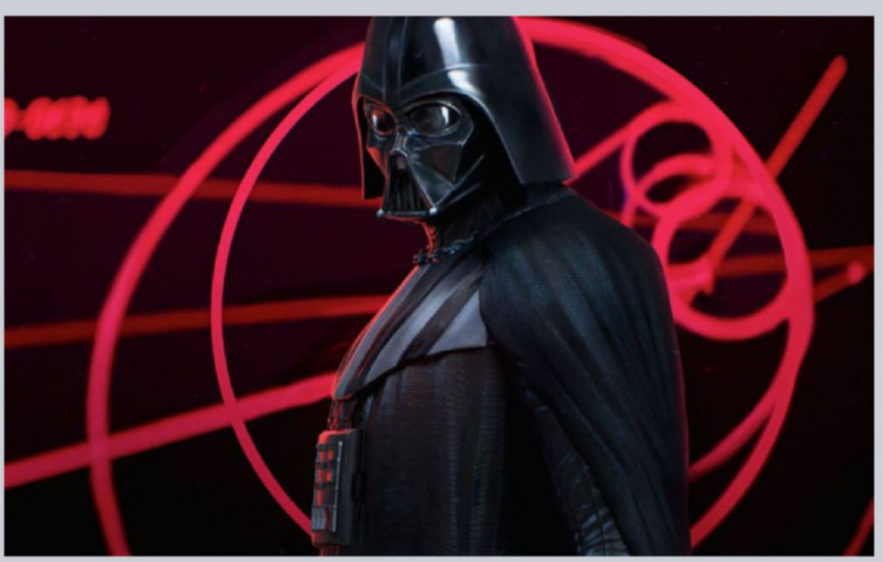


18 MOVE INTO PHOTOSHOP

The renders from KeyShot are imported into Photoshop to enhance the overall image and add in post effects. I use the clown pass render to help select parts of the character that need work. I go through the image refining elements, painting in details, adding additional texture and light effects with Layer Blending modes. I also modify the shapes of the character using the Image Warp function and Liquify filter.

19 FINAL TWEAKS

For the final step, I add in additional grunge textures in Overlay mode at a low opacity with Screen and Soft Light blending modes. I create Color Balance and Levels adjustment layers and modify the values and colours of the image. Then using merge layers I apply Lens Correction, Blur, Noise and Sharpen filters at various opacities to finalise the illustration.



Insert multi mesh brushes

I use the (IMM) Insert Multi Mesh brush to create the straps and chains of the character by dragging a curved stroke across the surface of the mesh. Then selecting the split unmasked points I can separate the strap object from the current mesh.

FOLLOW THE VIDEO
If you see the Play icon, use the link

ZBRUSH | SUBSTANCE PAINTER | KEYSHOT

TEXTURE A WORN ROBOT

Andrew Entwistle shows you how to texture a Star Wars droid using Substance Painter



AUTHOR

Andrew Entwistle
Andrew is a freelance 3D artist; most recent projects include leading the art of two titles for Sony Xdev Studios, that have just launched with the PSVR.
www.bugzero.co.uk

Over the next few pages, we'll be focusing on the texturing and rendering of this new character, K-2SO for the rebel alliance, that will feature in Star Wars: Rogue One.

We will focus on texturing the droid using Substance Painter to make him fit into the Star Wars universe; slightly reflective, yet dull and worn for that truly lived-in appearance. This will be broken down by surface damage, scratches, micro-noise and the roughness properties of the robot's surfaces, with a final layer of grime to build up depth like a true Star Wars prop. Finally, we will output everything for rendering in KeyShot for that advertising poster look. The model has been built in quads using subdivided surfaces, so it can be smoothed at render time using the surface normals of the mesh.

It is a childhood dream to be asked to do something like this; when I was growing up, as a child, I used to love getting a Star Wars figure for Christmas. So, considering this nostalgia and as an early Christmas present, you can download this model in its entirety from the online Vault.

It has been built for production in mind, but feel free to use it in any shape or form. It would be great to see what you do with it so tweet @bugzero_uk or hashtag with #Bugzero_Rogueone and show me your work!

DOWNLOAD YOUR RESOURCES
For all the assets you need go to
www.bit.ly/vault-216-starwars



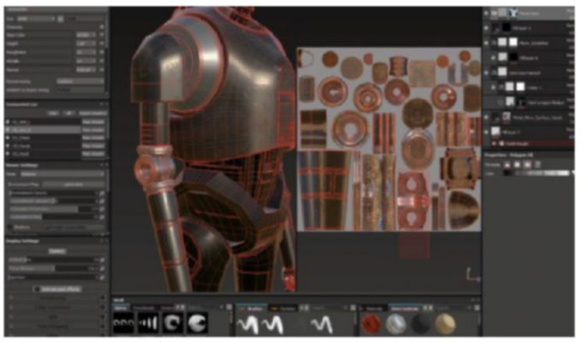

FREE!
GET THIS
MODEL





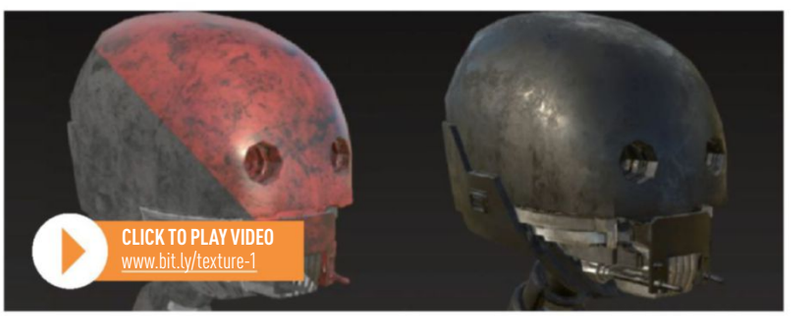
01 INITIAL SETUP

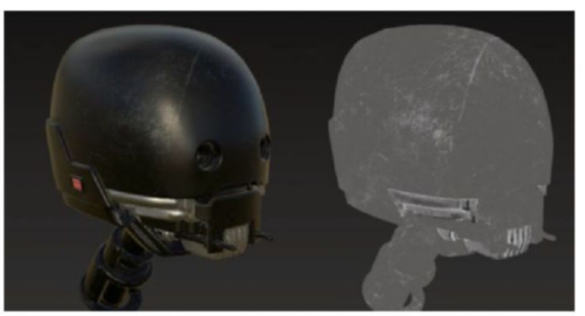
Download the model and you should find that it's ready for importing straight into Substance Painter. This has been set-up for a VFX production pipeline in mind. We will render in KeyShot and use the surface normals of the geometry with multiple textures per component. On importing into Painter, shaders are applied to each respective model part that require their own texture. To select the model parts use the Texture Set List window. UDIM's are not used since KeyShot does not support them



02 BLOCKING IN: SMART MATERIAL PRESETS

Using the presets that come with Painter, quickly block in the values and materials of the droid. Use Steel Gun metal that ships with Painter, and place this onto the model as a starting point, masking appropriately for the light trim and elbow joints by using the polygon fill tool, shortcut key [#4]. ZBrush is also used to create ID maps on the fly as and when required





03 BUILDING UP THE DAMAGE IN LAYERS AND METAL BLEMISHES

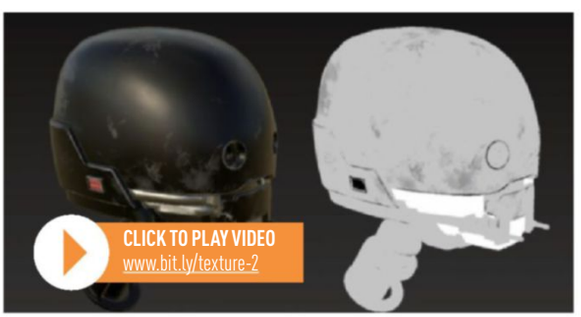
Although the smart presets serve as a good starting point, the layers are inspected one-by-one and replaced with custom layers better suited to this project as we want a custom appearance. The dark metal material properties of K2 are broken down into three categories; (Colours above are exaggerated in the images for clarity). Metal colour/roughness variety – In effect this is procedural noise to create a variety of metal blemishes all over the surface to make the surface appear more worn and even sun damaged. The roughness channel is tinted to help alter the light absorption.

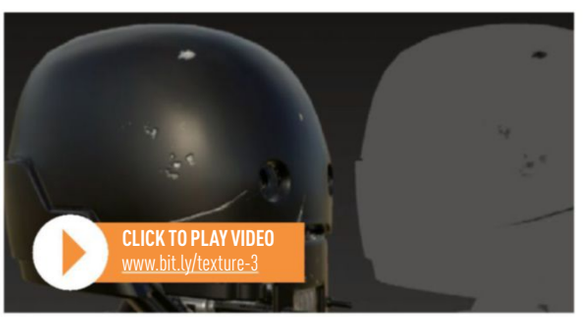
04 MICRO SCRATCHES

Next we want to add some scratches to give the droid a more used look. Create a new fill layer, mask it and then apply an MG Mask builder with a stock Grunge texture to Image Input #1 to apply scratches. Manipulate and balance to your liking by using the exposed sliders. With this layer, we are aiming to subtly help break-up the surface highlights.

Build a custom texture libary

It's handy to build-up a library of scratch textures, and to convert them into alphas for the perfect custom appearance.



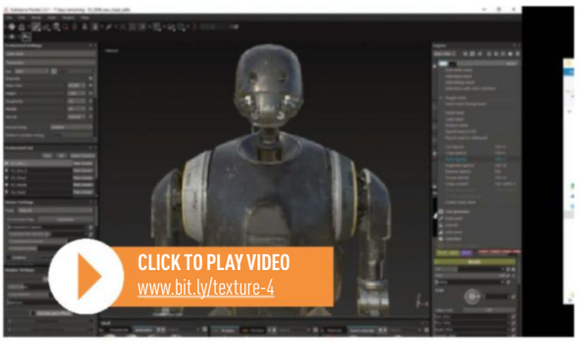


05 PAINT SURFACE SCRAPES

Again, use the MG Mask builder surface to create variety, for example, you could make it appear that the paint has worn off or picked up other coloured abrasions by K2 interacting with an environment. At this point, the metal texture is tinted to again add texture variety. Strengthen the idea that this droid has been around by adding deep battle damage: my aproaches are shown on the accompanying video walkthrough.

06 DEEP BATTLE DAMAGE

Battle scars can be done by hand and/or by using generators. There are two approaches that are demonstrated by video. Ultimately ensure the diffuse fill layer is white with some opacity; this is the paint primer. The height channel for this layer is tinted darker so we can carve the scratches nice and deep. If they are not sharp enough, add a sharpen filter to the layer by right-clicking for that freshly sheared appearance.



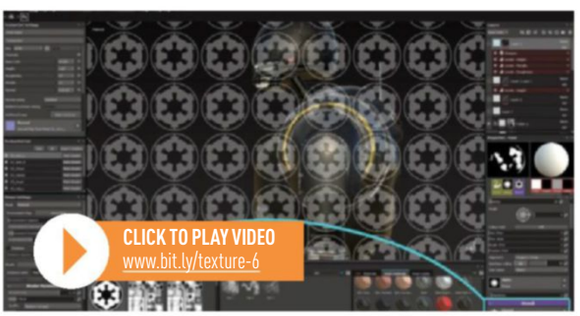
07 COPY AND PASTE

Now it's time to copy our material data across to the other nodes. To do so, group all your layers and name them appropriately, then right-click and create a Smart material. It will appear in your shelf ready to be used on the other components. By focusing on each component as we have done so far for the head, we can achieve the same level of detail for our other texture sets.



08 DIRT AND GRIME FOR THAT WEATHERED LOOK

Finally, a custom dirt/residue pass is completed across the model. This could be done using the particle brush system, but I feel like I get too amazed by watching it and have more control this way. Apply a fill layer and paint in a dark value with the Dirt 1 brush, around areas where it would collect. By applying an alpha to this layer and changing the brush alpha to Drips, this layer is then customised further with weathering streaks. Since Dirt is not reflective, its roughness is made white and metalness is turned to zero.



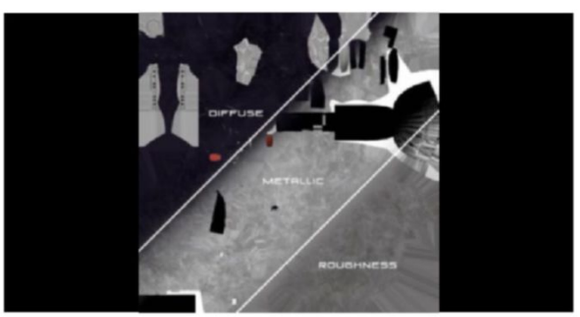
09 THE IMPERIAL ICING

For the grand finale, we now get to add that rebel logo on the shoulder plate! Drag the logo provided into your texture shelf. Whilst in brush mode apply the decal as a stencil to your brush by dragging it into your stencil slot. You should see it immediately tile across your screen. Press the [S] key, a gizmo will appear and with the [Alt] key and [MMB] you can move the stencil to your chosen position and scale with [RMB].



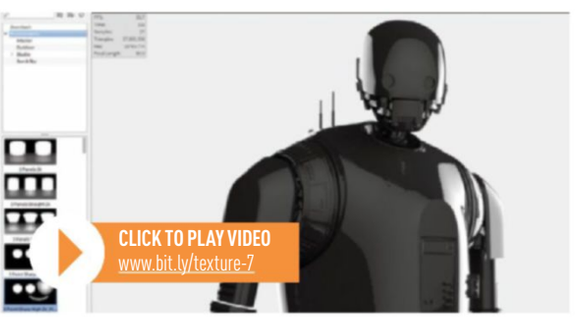
10 EMBLEM INTEGRATION

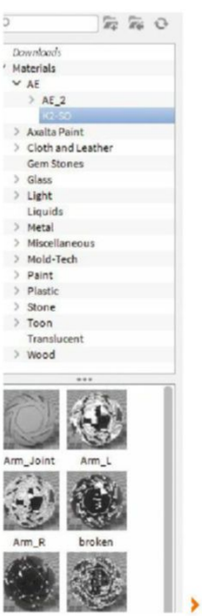
Rather than blocking in the decal 100 per cent as if it was brand new, I use a standard layer and the Crystal brush; as it has some noise in its alpha, from the outset I can give the emblem a worn appearance. To finish using the stencil, hit the [X] next to the brushes Stencil slot. To bed the decal into the metal surface I then apply a Surface Worn Smart Mask and alter the MG Mask Editor's Generator parameters to my liking. Roughness is then increased to break surface highlights by adding a level to only affect this channel.



11 KEYSHOT PREPARATION

The textures are exported from Painter using the KeyShot present configuration for Diffuse, Roughness, Height and Metallic. Before we take everything into KeyShot, subdivide your meshes until the geometry smoothens to your liking, whilst ensuring Smooth UV is not active under the Tools>Geometry menu. Remember, every subtool also needs to have a unique name as duplicates will not export.





12 MATERIAL PREPARATION

In ZBrush the diffuse textures are applied to the meshes in their texture map slot. This is done so UVs are sent with the model to KeyShot. Be mindful that between sessions, the KeyShot bridge may wipe over the materials you've setup if you change a subtool name, for instance. So, try not to rename subtools and keep everything as consistent as possible to prevent this. As a fail-safe, get into the habit of saving your materials in a folder.

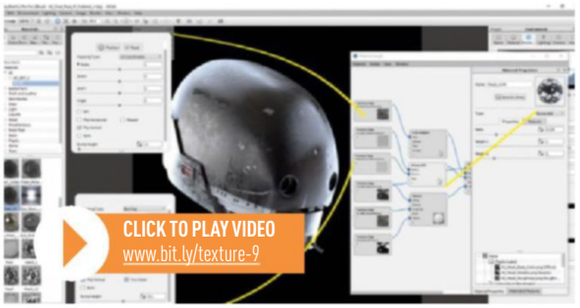
Isolate a component

To isolate a component quickly, you can right-click on it and then select Show Only in the menu pop-up.



13 MATERIAL FOCUS

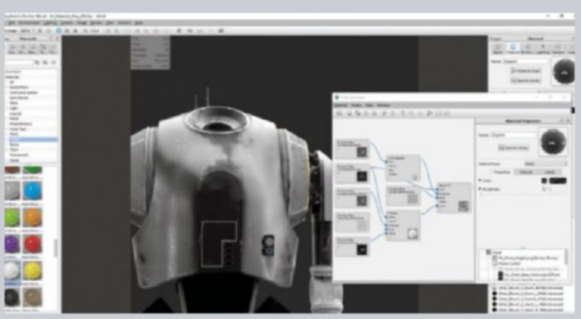
The head is isolated, since it has a large variety of forms (see boxout on the left), which allows me to focus and tweak its material properties. Using a metal shader, the rest of the textures are brought in and assigned one by one. Diffuse goes into Colour, Roughness goes into Roughness, Height goes into Bump. Spend some time adjusting the roughness texture brightness and contrast sliders to fine-tune to the desired look.

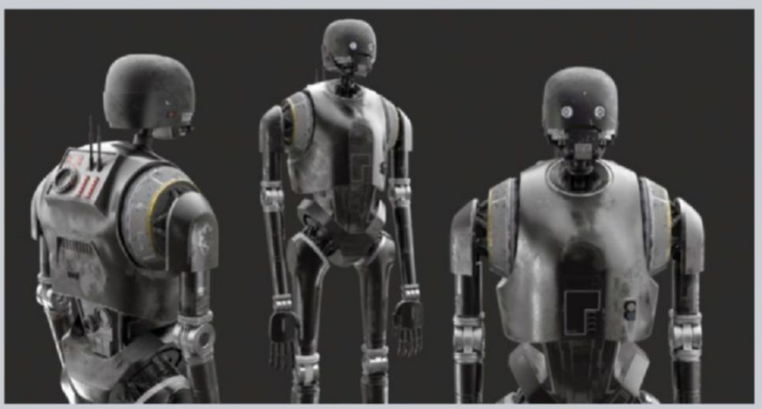


14 PERTURB THE SURFACE

To further enhance that metal feeling, a subtle grain is added to the model by layering in a simple noise texture. Using a Bump Add utility in KeyShot, the Chest height map is assigned along with the supplied Metal_Noise_Bump. Be sure to untick Sync on this texture so you can change the mapping to Box Map. Adjust the Bump Add ratio slider and texture intensities to your liking to balance the damage scrapes with this texture.





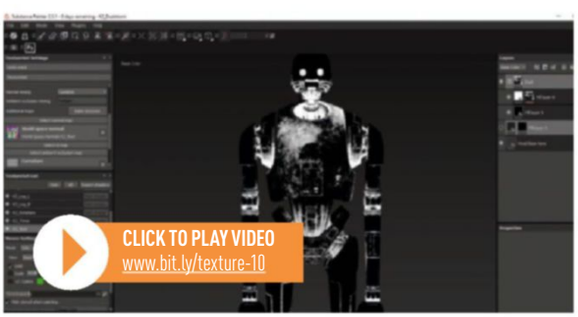


15 ADVANCE MATERIAL TUNING

Finally, labels are used and our roughness textures are layered into our material again to provide more control over the grimy appearance. Once you're happy with this material setup, we can then duplicate this shader and roll it out to the other components for consistency and assign their respective textures.

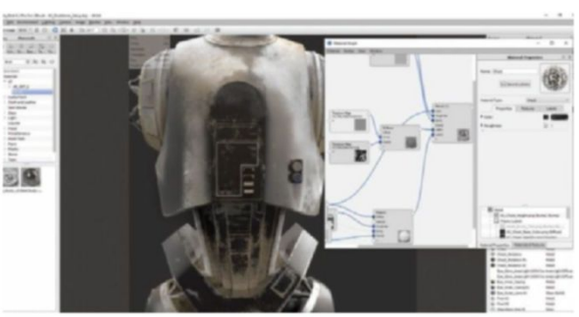
Painter adjustments

It's worth remembering that the height of the sandstorm can also be controlled by using the gradient slider.



16 CREATE A SANDSTORM EFFECT

In Painter add a white fill layer with a mask and a Mask Builder Generator. Add a custom grunge texture such as Dirt 1, reduce the default grunge value to your liking and use the AO slider to build up sand deposits in the panel crevices. Increase the layer's roughness, add some height and apply a Sharpen filter.



17 KEYSHOT DUST LABEL

Back in KeyShot, a 'diffuse material type' is added as a label to my shader with a sand RGB colour value. Within the material graph, I import the new textures and assign the base colour texture as the opacity mask, adding the height map into the bump channel for extra definition. You can develop the look further from here.

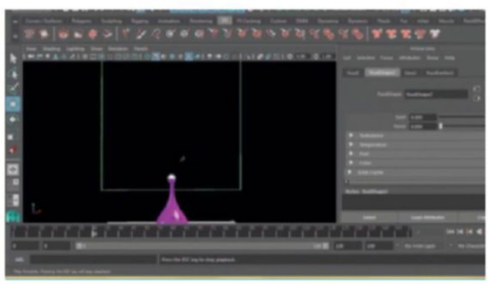
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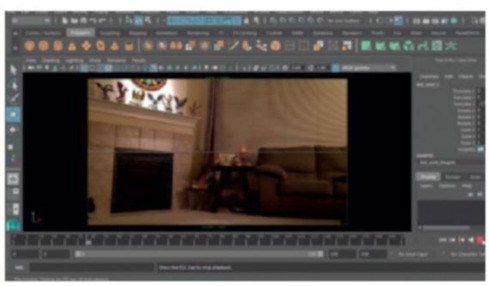
VFX TIPS AND TRICKS IN MAYA

A free video course to master Maya's VFX tools



SMOKE AND MORE
Discover how to use Maya and After Effects to create VFX for video games and films





This issue, we've joined forces with Pluralsight (formerly known as Digital-Tutors) to offer you a comprehensive video-training course that you can download from our online Vault – for free! Simply visit our online content downloads page at **www.bit.ly/vault-216-starwars** for the files.

In this course, Quick and Dirty VFX Tips in Maya, you will learn production-proven techniques for creating impressive visual effects in Maya, including creating smoke, flames, melting wax, and more.

The training will show you how to use familiar Maya tools and techniques in new ways to create unique visual effects. Whether you're new to Maya or a Maya pro, you're sure to pick up some interesting tips and techniques from Floyd Bishop's training.

For this tutorial course you will need Maya 2016 and After Effects.

FYI *To find more high-quality video training, visit Pluralsight at* **www.pluralsight.com**



AUTHOR

Floyd Bishop
Floyd is a computer animator with over 17 years of experience. Floyd has worked in film, television, commercials, web series, and games.
www.bit.ly/floyd_bishop

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ZBRUSH | UNREAL ENGINE 4

LEARN PLANT MODELLING FOR VIDEO GAMES

Jacob Norris shares his workflow for creating realistic foliage for video game environments

Jacob Norris
Jacob has over 10 years' experience creating art for video games, and offers training and assets on his PurePolygons website.
www.purepolygons.com

AUTHOR

When creating environments, foliage is always a great tool to add interest, colour and detail into an otherwise bland scene.

Some games I have had the opportunity to work on, such as Uncharted 4 and Metal Gear Solid V: The Phantom Pain, undoubtedly benefited from the use of foliage, and many consider these games to be very beautiful – partly due to their heavy use of foliage throughout the environments.

Foliage can also become overwhelming, detracting from the realism of a scene when not used correctly. That's why it is important very early on to do a lot of research to determine the climate of the environment you are creating. Even though a scene may have a summertime setting, does it snow in the winter time in this environment? Is it rainy throughout the year? Is the area known for wildfires? All of these factors contribute to the type of foliage that will be in the scene.

It's usually best to simply pick a location in the world that you want your scene to be in, because then you can easily begin researching your foliage to start gathering plant names for your environment.

With specific names and biomes that the plants come from, you can create detailed Google searches for leaves, bark, soil, lighting and weather, in order to find similar complementary plant types for your environment.

In this tutorial, we're going to take a look at some fundamental concepts for creating foliage, as well as how to keep your foliage optimised while making it look good. You'll learn new information about foliage creation for video games and can apply it to your future work. For more tutorials and video tutorials, visit my site at **www.purepolygons.com**, now turn over to start learning.

DOWNLOAD YOUR RESOURCES
For all the assets you need go to
www.bit.ly/vault-216-starwars



PREPARATION IS KEY
Jacob believes one of the most important things to do when working on a project like this is detailed research into the environment you're creating

01 FIND PLANTS THAT BELONG TOGETHER

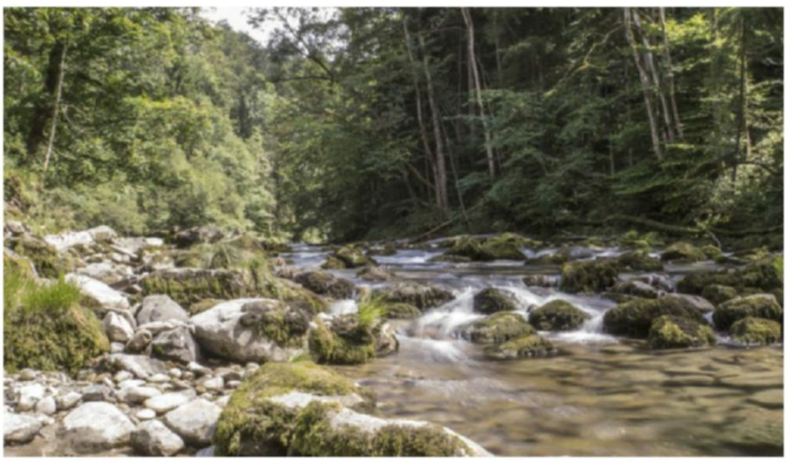
Finding a plant biome definitely increases the realism of your environment when everything actually works together. It can help to layout blueprints for your entire scene and add another layer of detail that will show itself in the consistency, harmony and composition of your final renders. Your biome can help you to discover all of the plants that grow within a given location. This will lead you down the right track to know what colours will be in your scene, how your plants can complement your environment's story, and help tie everything together.

02 WHERE CAN I GATHER RESOURCES?

It's always best to try to go out yourself and capture photos, textures and references for your project. If you can't do that, a search engine is definitely another option. Personally I find that going to a location and seeing it for yourself is always the best method. It allows you to see an environment from every angle and capture exactly the references you want. That's why I have recently finished a series of photo reference images, textures, and photogrammetry from many different locations in Europe, where I capture some of these biomes, climates and environments. They are already helping me in my environment artwork and if you are interested in taking a look they will also be available on my website and Gumroad pages under the name PurePolygons.

Do your research

People tend to ignore things that appear to be correct – that's great! It's only when something appears wrong that it's noticeable. That's why the research is important. All of this 'stuff' matters if you want your environment to be believable.



02

03 IS ALL OF THIS NECESSARY?

It may seem like this is going too deep when creating your environment. Why can't you just simply find a concept image or a picture that you can start working from? Well this is fine if you are simply recreating the image that you found, but if you are working on an environment for a game, your level will be much larger and contain a lot more information that you won't simply find in that picture. For example, if more elements start entering the scene, such as buildings, houses, mountains, rocks, vehicles, lakes, rivers… how will all of these interact with each other? In image 03 we see a perfect example of this. The nearby trees are littering the ground with seeds, berries, nuts, and leaves. We are also seeing the intricate connecting tree root systems along the ground. This is highly relevant to how we will create our textures and models for this area. All of these details add layers and layers of realism to your scene. It matters.

04 REALISM IS SUBTLE

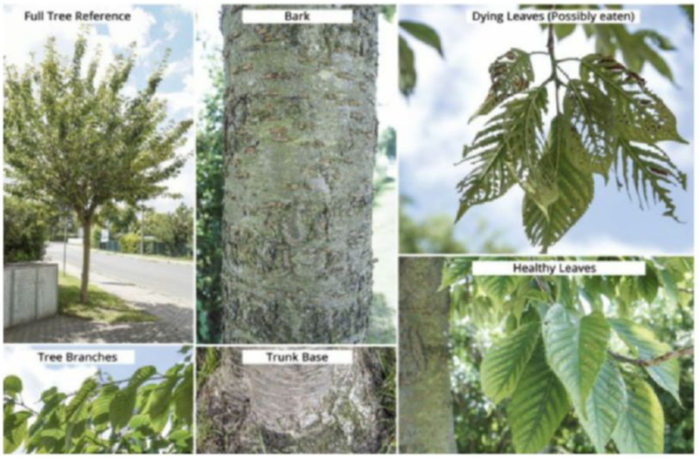
As humans, some things we perceive are subconscious and when we have seen all of these environments in nature, or in movies and TV shows, we'll start to notice that something isn't right. These plants don't work together or these trees don't play well with each other. So avoiding that moment where people say, "something doesn't look right," is what makes your environment feel natural. That's why the research is important; the biomes, the complementary plant types, the climate information, and all of this 'stuff' actually matters if you want your environment to be believable. This leaf is in a damp environment where dirt and dust from the rain drops build up on its surface. The wet environment also pushes the lush green saturation of



03



04



05



06

the leaves. Check out the roughness response on the leaf as well; knowing the plant this well will help the overall read of your plant from far away, when your materials are reacting to light properly.

05 GATHER PLENTY OF REFERENCE IMAGES

This is also extremely crucial to the process of creating a unified environment. Now that you have your plant names, climate, biome, and all of the important information, this is your chance to use it. Search far and wide to find all parts/life cycles of the plant. Find the dead version, the live version, the branches, leaves, dying leaves, possibly eaten leaves, bark, moss growing on the tree, or better yet, if you live near that type of environment go out and take some pictures! Image 05 is an example of some corresponding references for plants within a specific biome.

Be thorough

Search far and wide to find all parts/life cycles of the foliage. Or better yet, if you live near that type of environment, go out and take some pictures!

06 PICK APART YOUR REFERENCE

The next step is to start planning out your workflow. You can save yourself a huge amount of time at this stage, because perhaps there are similar leaf types amongst your trees or bushes. Even if they aren't exactly the same, think of a way that you may be able to slightly alter the leaf you are making to work for your other plants.

07 DON'T WORK HARDER, WORK SMARTER

Twigs and branches can usually be shared between many of your plants. Don't make extra work for yourself and create unique twigs and branches for all of your assets. See if there are similar shapes again between your trees or bushes. Then you can create a simple base mesh branch/twig that can have slight adjustments made to it to change the bark, or to create broken/dead branches. Spread this idea to everything. It will most likely be the same type of moss growing on the tree trunk as the moss growing on the rocks nearby. The grass can be re-used for your grass cards, as well as laying flat on the ground in your landscape texture. In image 07 I am using the same ZBrush grass blades that I created for the ground and turned them into alpha cards to populate on top of the same ground surface. It makes everything feel very connected.

08 START SMALL AND THINK MODULAR

Now that you have started to plan your workflow and pick apart your reference images better, it's time to start modelling. Start small and create some re-usable ZTools or alphas inside of ZBrush, or Mudbox, depending on your software of choice. Create your leaves, flowers, branches and so forth, and then you can start to piece them together to make larger pieces. An entire tree ›


07



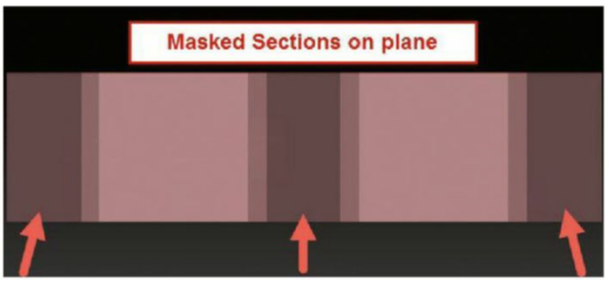
08



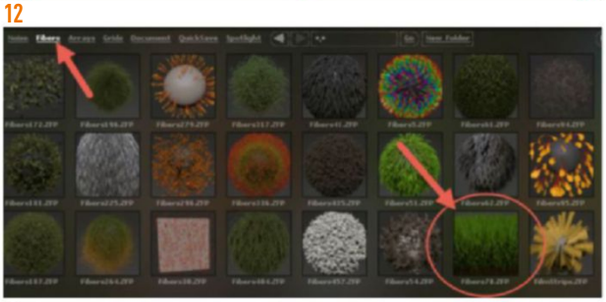
09



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13

canopy of branches/leaves can be built with just a few assets used in a smart way. Image 08 is an example of starting small, where Colin Valek began building individual leaves for these pine tree branches in the PurePolygons' Procedural Nature Pack Vol.2. After he has some simple pieces that he can re-use, it becomes very easy to branch out and make larger pieces, all starting from those first small pine leaves!

09 ZBRUSH IS YOUR FRIEND

There are tons of great plugins and workflows inside of ZBrush to create your foliage assets. Take for example FiberMesh. Let's see how quickly we can create some grass using FiberMesh. Start by going to your ZTools in the upper right-hand corner of ZBrush and creating a Plane 3D ZTool using the ZTool slider.

10 CONVERT YOUR PLANE TO A POLYMESH

Simply click and drag anywhere in the empty scene to pull out your Plane 3D ZTool. If you hold [Shift] while you are doing this you can ensure that the plane is aligned properly to your camera view. Then click the button Make Polymesh 3D. You will find this button in the same ZTool box that you found the Plane 3D ZTool in. Your scene should now look like image 10.

11 PREPARING OUR FIBERMESH PLANE

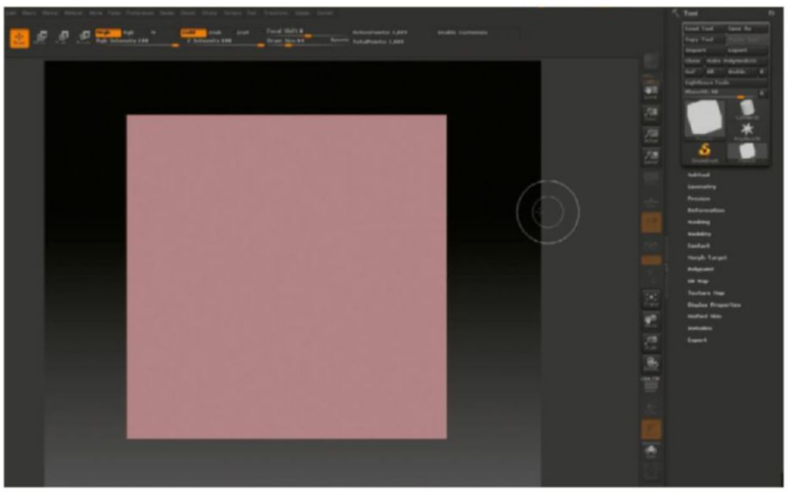
We are going to use this plane to paint some FiberMesh on and create our grass. This method will allow us to capture an Alpha, Normal, and Albedo map from the grass blades. It's super quick and can provide really nice results, with just a bit of tweaking here and there. Let's go ahead and make our plane a bit thinner now, since we only need a couple of grass blades for our alpha. Go to the Deformation menu and adjust the size in the Y axis. Then decrease the size to -100. Do this again to -100 so that our plane becomes much thinner.

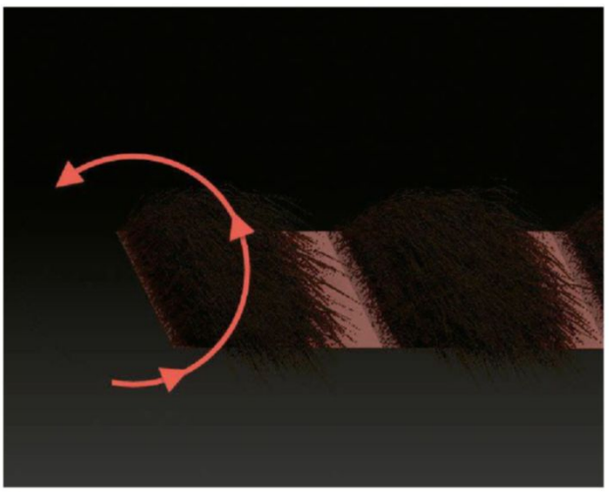
ZBrush options

There are so many great plug-ins and workflows inside of ZBrush that you can use to create your foliage assets – get exploring!

12 PAINTING OUR GRASS MASK

We're then going to hold [Ctrl] on the keyboard as we paint three evenly spaced lines on our flat plane. This will create a mask on top of our plane that is roughly the same width in each line. Inside of these masks is where we are going to


10


14



15a



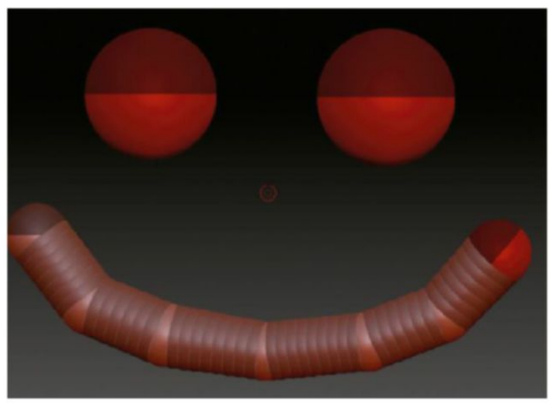
15b



15c



16



17

spawn our FiberMesh for the grass. We are doing this so that when we capture our grass alphas, they are spaced far enough apart to keep them separate. For another quick screengrab of what our plane with masks looks like at this point take a look at image 12.

13 CREATING OUR FYBERMESH GRASS

Under your Tools menu on the right, scroll down to find the FiberMesh option and open it. In here you will see a tab for Lightbox>Fibers – select this, it's where we will find our FiberMesh. I personally prefer to use Fibers78.ZFP for my grass, but feel free to experiment and see what works best for you. Go ahead and double click on it and that should load the FiberMesh onto your plane into the three masked areas that we set up earlier.

14 ROTATE YOUR PLANE SO IT'S INVISIBLE

At this point we are able to rotate our plane so that it lays flat from our camera view, and the only thing that can be seen is the grass FiberMesh. If you hold down the [Shift] key while rotating the camera view around the plane, it will snap your view so that the plane is perfectly flat. This means you can now see the FiberMesh better.

Use ZSpheres

This advanced tool in ZBrush turns modelling the base mesh of a branch into a 30-second process instead of a 30 minute process.

15 TWEAKING YOUR FIBERMESH

Open up the Modifiers tab under the FiberMesh menu to start playing around with the settings for your grass. There are tons of great options in here to really create some very custom and unique looking grass. Try to keep your grass count low here. Decrease the Max Fibers number. We don't want our grass too thick or it starts to look like fur when we begin populating our environment. Increase the number of segments for more detailed blades of grass, with less polygon looking bends. For a screenshot of my settings and resulting grass from the FiberMesh, see images 15a-15c.

16 CAPTURING YOUR NEW GRASS

Once you are satisfied with the result simply click the Accept button in the top right of your FiberMesh menu. You now have some fully realised 3D grass. From this point there are a number of ways you can turn it into a usable foliage in your scene. Bake it down in your favourite baking software such as xNormal or 3ds Max. Or simply GrabDoc the grass and its alphas directly inside of ZBrush and create the textures from the results of that GrabDoc. If your scene can handle it, you can even use this grass as actual 3D models, but this is definitely not recommended for real-time projects, videos games, or VR projects. Enjoy your new grass!

17 USING ZSPHERES FOR BRANCHES

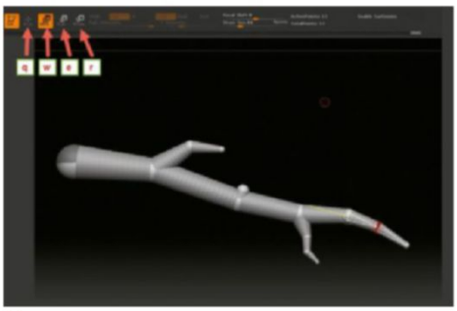
Let's see what other types of fun things we can use ZBrush for. It's really great for creating branches and twigs! If you have never used ZSpheres before, then you are missing out. It turns modelling the base mesh of a branch into a 30 second process instead of a 30 minute process. Using ZSpheres can take some getting used to, so definitely take some time for yourself to get acquainted with using them and make a bunch of branches, models, bugs, people – anything you like once you get the hang of them. ZSpheres could be a whole tutorial in itself, so I also recommend Googling some more information and finding some YouTube videos if this part is a bit difficult for you.

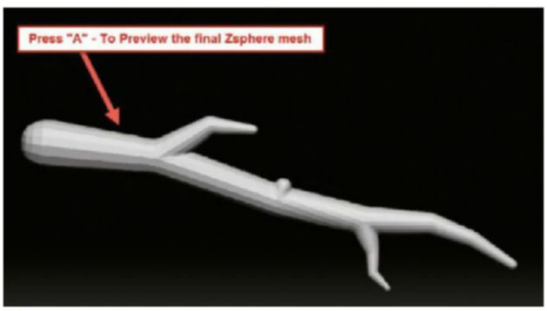
18 CREATING A ZSPHERE

We're first going to select option 46 from our slider in the ZTools section in our menu, on the right. It should say ZSphere_1. If not, then keep moving the slider around until you find the ZSpheres. Make sure you are in Edit Mode by pressing [T] on your keyboard and ›



18

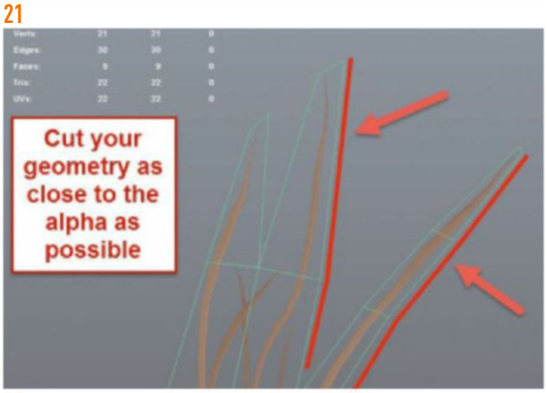

20



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checking the icon is highlighted in the top left of your ZBrush window.

19 ADDING MORE ZSPHERES

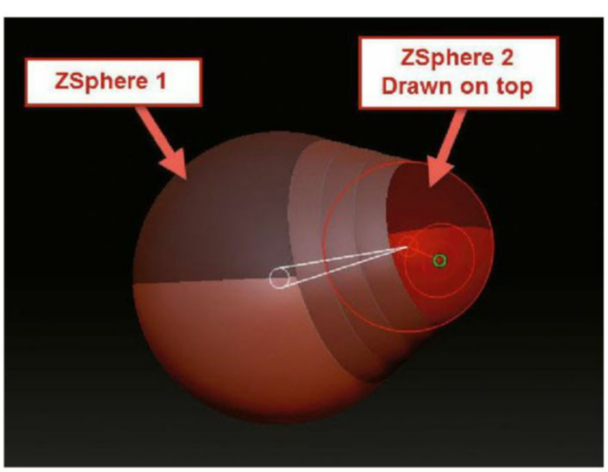
Now from here, you draw ZSpheres simply by clicking and dragging on the screen. Once one ZSphere is drawn on the screen, you can only add more by drawing another ZSphere that touches any part of the ZSphere mesh that you have created.

20 GETTING CRAZY WITH ZSPHERES

Hopefully you now have two ZSpheres on your screen. You can press [W] on your keyboard to change to the Move tool and move your ZSpheres away from each other and around the screen. You can also scale each ZSphere by pressing [E] on your keyboard to switch to the scaling tool. If you press [R] on your keyboard, this is the Rotation tool to rotate your ZSpheres. Once you want to draw another ZSphere on your screen you now have to press [Q] on the keyboard to go back into your Draw mode. And as before, you can only draw ZSpheres on top of other ZSpheres, or on top of the connecting mesh that bridges two ZSpheres together. After playing with them, drawing some, rotating, scaling, and moving them around, we can then make ourselves a branch object that looks similar to image 20.

Further tutorials

ZSpheres could be a whole tutorial in itself. I recommend researching some more information about them and finding YouTube tutorial videos, to really see their full potential.



19

21 PREVIEWING YOUR ZSPHERE MESH

While you are creating your ZSphere mesh, you may be wondering, "What is this thing going to look like when I'm done?" This is easily achieved by pressing [A] on your keyboard at anytime with your ZSphere mesh active. It's a great way to see what is or isn't working, and what you might need to adjust/change while creating your mesh. I'm pretty happy with this one for now so I am going to call it done and move on to the next phase, which is finalising the ZSphere mesh.

22 FINALISING YOUR ZSPHERE MESH

In order to convert this to a usable mesh, press [A] on the keyboard again, to preview the mesh. You will see that once you do this, the option now appears in your ZTools menu to Make PolyMesh3D. Once you click this button it will now convert your ZSpheres into an editable mesh that you can sculpt on, add detail to and make into a beautiful branch of your own.

23 EXPLORE OTHER OPTIONS

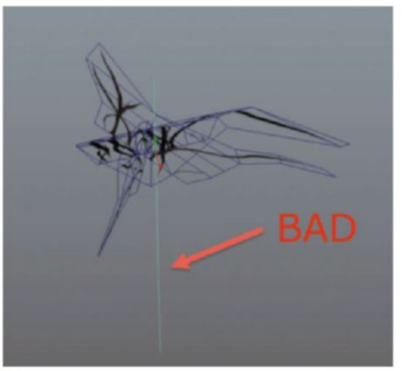
ZBrush isn't your only option for creating foliage, meshes, and other environment details. While it creates the most unique results, since everything is handmade, it can also be time consuming for bigger projects. So perhaps it's time to look into other options for your specific needs. SpeedTree can be excellent for making quick trees and even optimising them for games. It provides really nice models out of the box, but perhaps not as photo realistic as some would like. Even if it gets us to 70 per cent of what we want, we can take it from here and add our own textures. Add some custom sculpts on top of here, or any other updates that you feel can help bring it to that 100 per cent quality you are looking for.



26



27



28

24 IT'S NOT ME IT'S VUE (AND PHOTOGRAMMETRY)

I've seen many people using Vue for creating grass and simple foliage as well. There are also some great tutorials for this directly on YouTube that you can find really quickly. So definitely check out all of these programs and see what might work best for your needs. Many people are taking to photogrammetry these days as an option for creating foliage. You simply scan leaves, branches, stems, twigs, and then bring it into your favourite 3D program to create some re-usable assets that can be placed around your scene. Let's take a look at how we can use photos and photogrammetry to our advantage.

25 OPTIMISATION AND GAME READY FOLIAGE

After you have captured your foliage alphas with photos, taken them from Quixel Megascans, exported them from Vue, created them in ZBrush, or any of the above, you will need to set up your alpha planes to be used with your textures. I am using Maya in this example, but the basic idea is the same in any 3D modelling program. You will apply your foliage material to a flat plane, then start cutting the geometry around your alpha texture. In the example (image 25) you will see that I am trying to cut my geometry as close to the alpha texture of the grass as possible. I am also trying to keep the grass alpha card decently low poly, at around 22 Tris.

26 TRY AND AVOID OVERDRAW

This is all for optimisation purposes of course. Because when an alpha card like grass or leaves is rendered in real time in a video game, since it is not a solid opaque texture, objects behind the grass have to always be rendered and cannot fade out or occlude from the GPU's rendering (Graphics Processing Unit). This is called Overdraw. Normally with a solid object like a crate or a barrel, objects behind this crate/barrel don't need to be calculated by the GPU, because they cannot be seen at all. In the case of these grass blades though, the GPU has to do double the work. It has to render the grass alpha card first and then also render everything behind it, so the more sloppy your cards are cut, the more grass card geometry will be overlapping each other in your scene and the more work your GPU will have to do. This can start to slow down your game and increase frame rate very quickly. So be accurate, concise, and create your foliage correctly at this stage.

Details matter
The more care and attention to detail you put into every aspect of even the smallest parts of your environment, are what helps the scene as a whole to really shine.

27 EVERY SINGLE POLYGON MATTERS

The same goes for polycount; don't add too many polygons, because these are small blades of grass and when you end up placing 10,000 of these in your scene, every single polygon matters. Deleting three polygons on your grass alpha cards will then save you 30,000 polygons.

28 TRY TO AVOID COMPLETELY FLAT ALPHA CARDS

Here we have a completely flat alpha card in this grass clump. You can see why this would be a bad thing to have in your grass. When an alpha card is completely flat, there will be certain camera angles where your grass card will completely disappear. This causes you to lose a lot of density in your foliage that could very easily be fixed with some small bends and rotations in your geometry. Notice the other alpha cards; they have subtle twists, rotations, and bends in their geometry and it doesn't take much. It gives you much more bang for your buck!

29 IT'S THE LITTLE THINGS THAT MATTER

I added some simple bends to this dying grass and now this grass will look good from whichever angle you choose to look at it. Adding in those subtle touches and doing just a teeny tiny bit more work helps your final result just that much more, and people will notice.


29

FOLLOW THE VIDEO
If you see the Play icon, use the link

CINEMA 4D R18

HOW TO MASTER CINEMA 4D'S NEW OBJECT TRACKER

Joseph Herman reveals how to use the Object Tracking function to attach 3D geometry to a moving object in live action footage



AUTHOR

Joseph Herman
Joseph Herman is an animator, filmmaker and visual effects artist from New York City and operates his own studio, called Legend Animation.
www.legendanimation.com

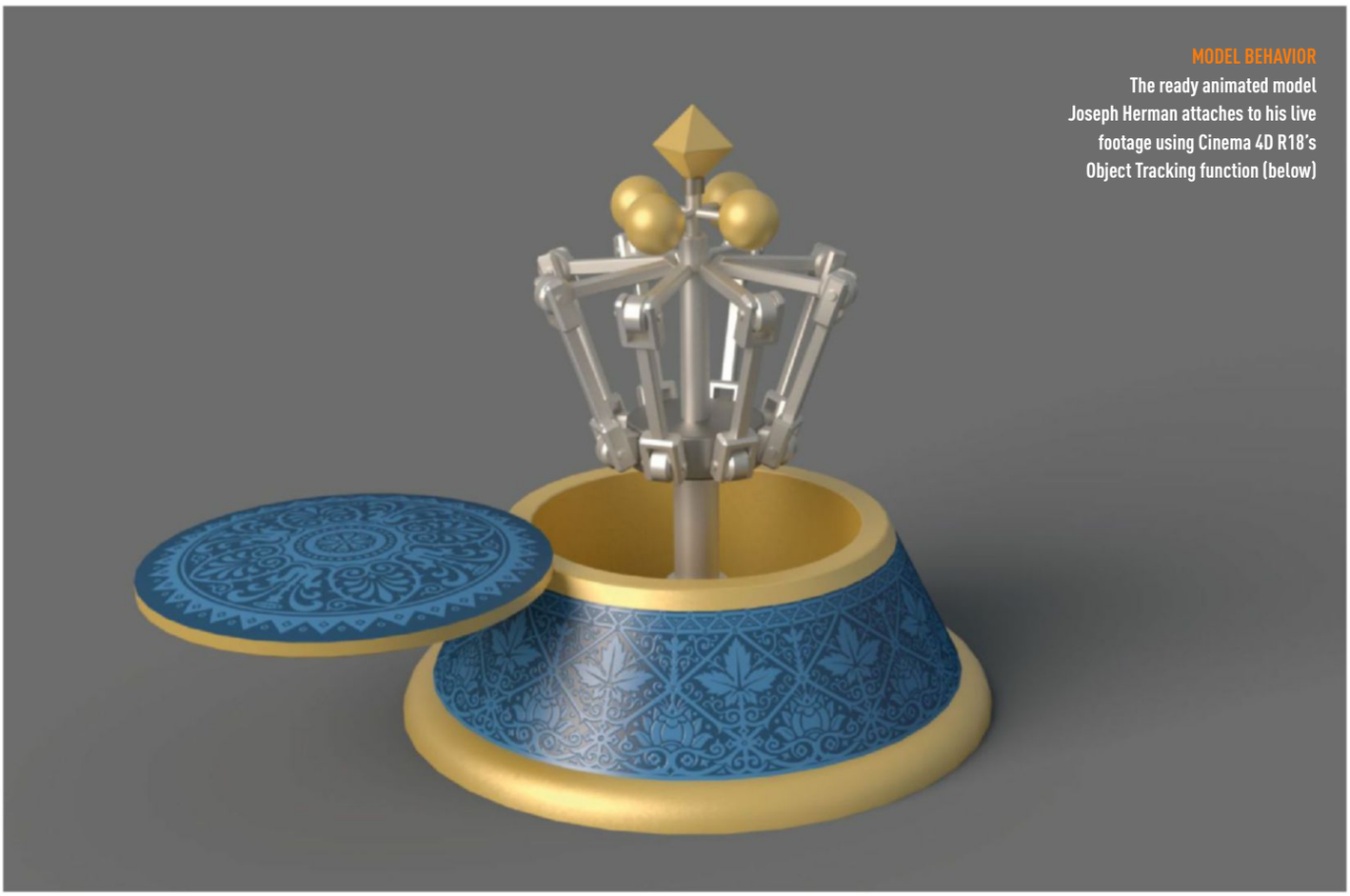
The latest version of Cinema 4D R18 included many great new features, but a standout for me was the new Object Tracking function. Unlike Motion Tracking (introduced in Cinema 4D R16), which solves for camera motion, Object Tracking allows you to track moving objects inside of live action footage.

Object Tracking allows you to do things like affix 3D models onto objects within a scene. For example, you may wish to add a blaster to the back of a pick-up truck as it drives through a rugged terrain or put a mask on someone's face as they rotate their head this way and that.

For this project, I took a small bowl with a few track points drawn onto it and filmed myself moving it around. In this tutorial I'll show you how to bring that footage inside of Cinema 4D and use the new Object Tracking functionality to track the bowl while using the Motion Tracker Graph View as an aid. Once it is tracked, we'll add a previously modelled and animated mechanical contraption to the top of the bowl. Since the contraption exists in another file, we'll import it as an X-Ref into Cinema 4D.

Object tracking is a very visual process so please be sure to watch the accompanying video tutorial to gain a fuller understanding of the steps involved. You'll find the video in this issue's online Vault, along with my texture files and Cinema 4D scene files.

DOWNLOAD YOUR RESOURCES
For all the assets you need go to
www.bit.ly/vault-216-starwars



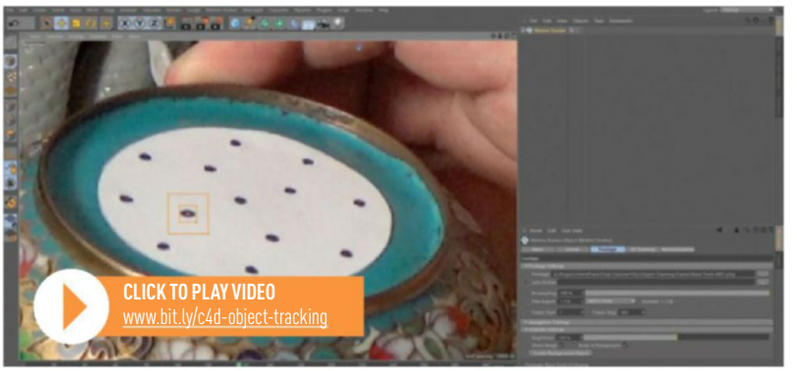
MODEL BEHAVIOR
The ready animated model Joseph Herman attaches to his live footage using Cinema 4D R18's Object Tracking function (below)





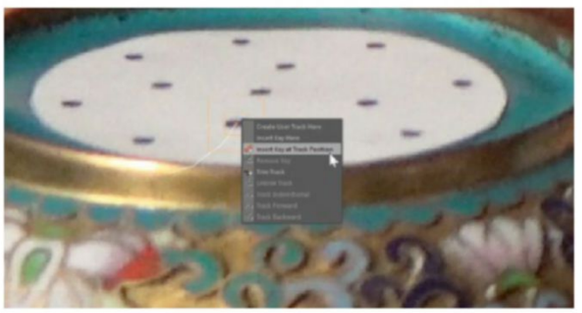
01 IMPORTING THE FOOTAGE

To import a .png sequence, select Motion Tracker in the Motion Tracker menu. (this creates a new Motion Tracker object). In the attributes manager, in the Footage tab, click the button to the right of the Footage field to import all the frames inside of the Object-Tracking-Frames folder. Increase Resampling to 100 per cent, this improves the appearance of the footage and increases the tracking accuracy.



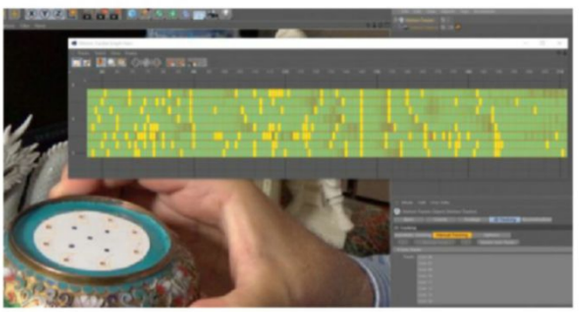
02 SETTING UP THE TRACKS

In the Attributes tab of the Motion Tracker, click on the 2D Tracking tab, then click on the Manual Tracking tab. Zoom and pan the footage to a frame where the black markers on top of the bowl are closer to the camera. Ctrl-click on one of the dots to create your first track, which appears in the User Tracks list as User 01. Resize the inner box of the track to snugly fit the marker. The default size of the outer search box should be fine.



03 TRACKING THE FIRST TRACK

Press on < Manual Track > to track User01 in both directions. Scrub the time marker forwards and backwards. Notice that the track stops tracking at some point and turns red. Go to the last good frame and right-click on the tracker and choose Insert Key at Track Position. This creates a new keyframe for the tracker and extends the track further.



04 EXAMINING THE GRAPH VIEW

The Motion Tracker Graph View is a useful window that provides valuable insight and information while you track your shot. To view it, choose Motion Tracker Graph View from the Motion Tracker menu. Each tracker will be represented horizontally. Green represents good frames. Yellow represents keyframes. You can also see what part of your tracks are working or not. Watch my video for more details on using this tool.

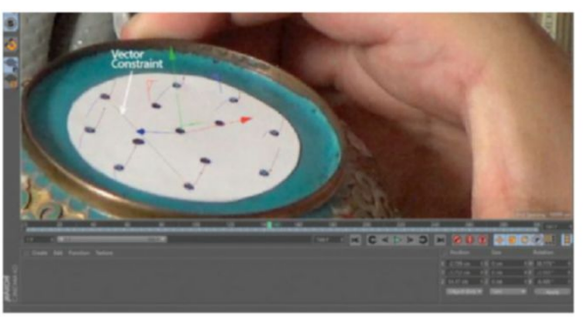
Use the Graph View

The Motion Tracker Graph View, found in the Motion Tracker menu, provides valuable feedback while you're tracking your scene. Be sure to keep an eye on it during the entire tracking process.



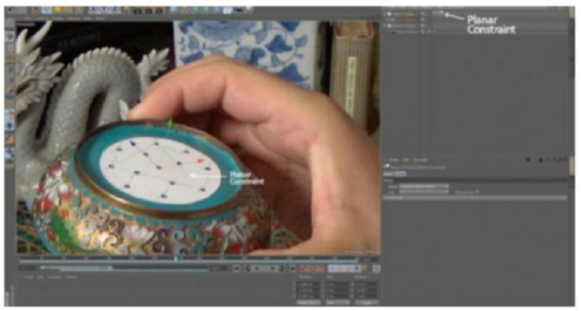
05 CREATE THE OBJECT TRACKER

In the Motion Tracker's attribute manager, in the 2D Tracking tab, in the Manual Tracking section Shift-click to select all the Tracks in the User Track List, then choose Object Tracker from the Motion Tracker menu. A new Object Tracker appears in the Object manager. In the Trackers tab, click Assign Selected to assign the selected tracks to the Object Tracker. Switch to the Reconstruction tab and click Run 3D Solver for Object. It may take a few minutes to complete so be patient.



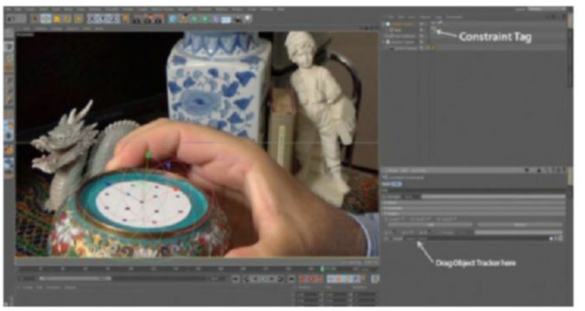
06 SETTING THE SCALE

After tracking, expand the Object Tracker to see all of the User Features (nulls) that have been added. Right-click on the Object Tracker and from the pop-up menu choose Motion Tracker Tags>Vector Constraint. A line for the vector constraint appears. Drag each end of the line to the two track points (as shown above), they'll snap into position. In the attributes manager, change the Length to Known and make the amount 3.81 cm (1.5 inches).



07 ORIENTING THE OBJECT

Right-click on the Object Tracker and from the Motion Tracker Tags sub-menu choose Planar Constraint to add its tag to the Object Tracker. Note that a triangular shape appears in the viewport. Drag each vertex of the triangle to a separate marker as shown in the image. This will define the top plane of the bowl. Next, set the Axis of the Vector Constraint to Y. This will orient the object tracker correctly to the top of the bowl.

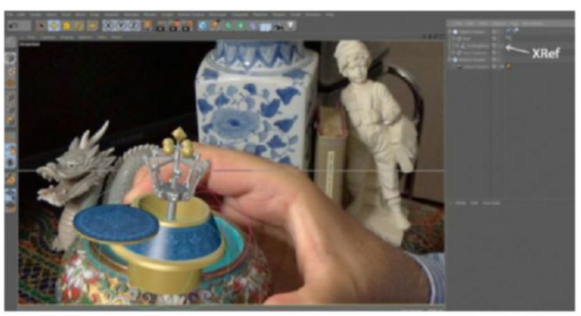


08 ADDING THE CONTRAPTION

Create a null, name it ObjectNull and make it a child of the Object Tracker, Right-click on it and add a Constraint tag to it from the Character Tags sub-menu. Set the type to PSR, and in the PSR tab drag the Object Tracker into the Target field to stick the null to the Object Tracker. The Contraption exists in a separate file, so we'll add it as an XRef. From the Create menu under XRef, choose Add XRef and pick Contraption.c4d.

Use a minimum number of trackers

It is not necessary to track all the markers on the top of the bowl. Try to limit it to nine or eight trackers. See the video for important information about more versus less tracker points.



09 ARRANGING THE CONTRAPTION

Make the contraption XRef a child of the ObjectNull and in its Coordinates tab, set the X, Y and Z coordinates to zero to centre it on the bowl, and its H, P and B rotations to 0 to correctly align its orientation. The animation of the contraption has been built into the XRef. Scrub through the frames to get a real time preview of the contraption as the top slides open and the mechanism on the inside is revealed.



10 HIDING THE BOTTOM

To hide the bottom of the contraption with a Boolean, create a cube, make it a child of the null and make its size 6cm on each dimension. Next set its X and Z coordinates to zero, and its Y coordinate to -3 so it covers the bottom completely and leaves the top in view. In the Create/Modeling submenu, choose Boole and make it a child of the ObjectNull. Make the cube and contraption a child of the boole (the cube should be on the bottom).



11 WRAPPING UP

You'll want to add a couple of lights (key and fill) to approximate the lighting in the original video. You can also add a shadow catcher on the top of the bowl for enhanced realism. You may also wish to add an object buffer to the contraption to generate a matte for compositing. You can also watch my accompanying video walkthrough where the steps on these pages are demonstrated. Make sure not to miss it. Good luck with your own tracking projects.





FOLLOW THE VIDEO
If you see the Play icon, use the link

BLENDER

CREATE STYLISED TEXTURE TILES IN BLENDER

Pierrick Picaut explains how to make better use of Blender's Dynamic Topology system



AUTHOR

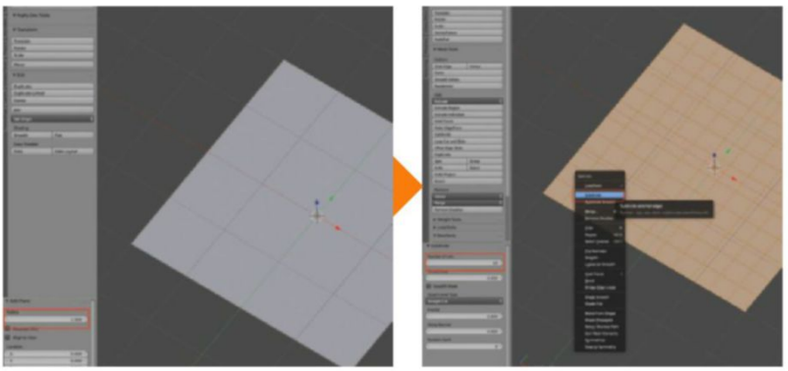
Pierrick Picaut
Pierrick is a freelancer 3D artist and founder of P2design. He's a Blender foundation certified trainer and also produces tutorials and digital courses.
www.p2design.eu

Blender offers some really nice sculpting tools, with a good Dynamic Topology system that enables you to generate geometry – as well as add and remove details. Although ZBrush's DynaMesh allows sculpting without constraint, you still need to update your mesh often in order to sculpt further. However, Blender's Dynamic Topology sculpting generates geometry on the fly, allowing you to increase or remove details on parts of your mesh, without needing to flood fill the model with the same volume of polygons – that's one of the big strengths of Blender's sculpting tools. It also includes a smooth tile system in Sculpt mode, which we'll be looking at this during the tutorial.

However, what I really want to take you through is my process for creating nice-looking, tileable textures in Blender. In particular, we'll be looking at how to create stylised wooden and stone tileable textures from sculpted surfaces. Using a hand sculpting method will allow us to bring a nice style to our tileable texture and also output all the different passes needed (ZPass, Normals, AO and so forth). This tutorial is an extract from my larger, in-depth workshop, The Cliff Tower course. If you're eager to get the full course, as a 3D World reader you can get an exclusive 20 per cent discount using the coupon code: 3Dworld. Go to **www.gumroad.com/l/TheCliffTower**.

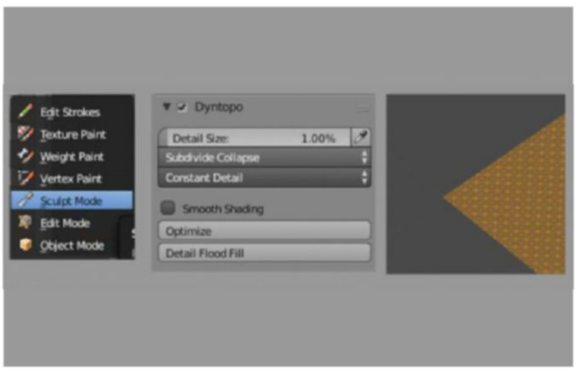
You can follow the training on these pages, and also download my video walkthrough, textures and HDR files from this issue's online Vault.

DOWNLOAD YOUR RESOURCES
For all the assets you need go to
www.bit.ly/vault-216-starwars



01 PREPARING THE DOCUMENT

Create a new Blender file, remove every default element (camera, cube and point lamp) by pressing the [A] key, then [X] key, and confirm. With the 3D cursor snapped to the origin of the document (hold [Shift]+[S] to centre), let's add a plane by pressing [Shift]+[A] and set its radius to 2 so that we get a 4x4 Blender units plane. Press [Tab] for Edit mode and press [W], then from the menu, subdivide the plane a few times.



02 GETTING STARTED WITH TEXTURE SCULPTING

We can now go into Sculpt mode and enable Dynamic Topology by pressing [Ctrl]+[D]. In the Tool panel on the left, using Constant Detail mode, we'll set the size to 1% and click Detail Flood Fill to get a high density and homogeneous mesh.

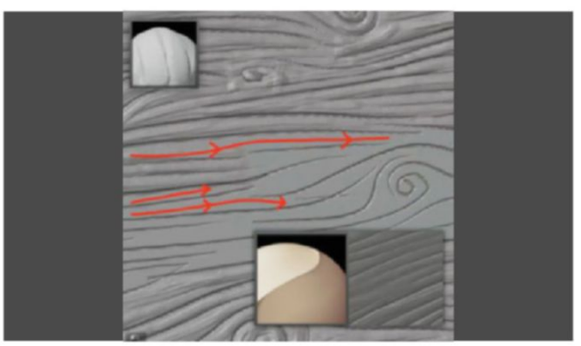
Handmade feel

To create stylised textures you need to give them a handmade look. Find some cartoonish references of wood and observe that you can choose to have very smooth and exagerated curves or use very squared lines to create the wood veins.



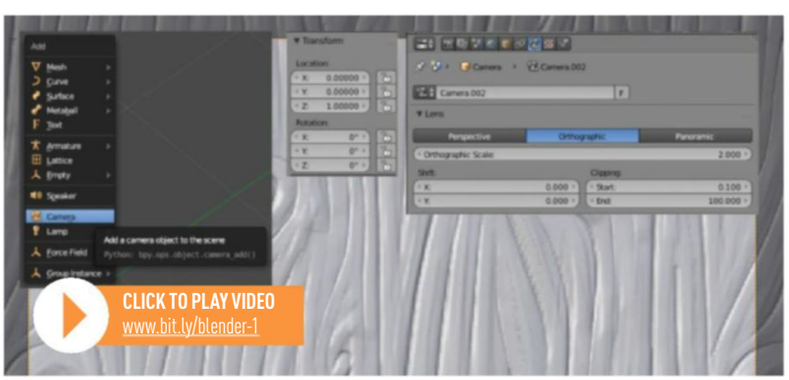
03 CREATING WOOD PATTERNS

In the Symmetry option of the Tool panel, enable the tiling on all axes (X, Y ,Z) and use a tile size of 2. With the Draw brush, start carving the main wooden veins, your stroke automaticaly repeats on the surface with a constant offset outputing the tileable pattern. Don't use the same pattern too much and use a mix of curvy and straight lines. For more control enable the Smooth Stroke option.



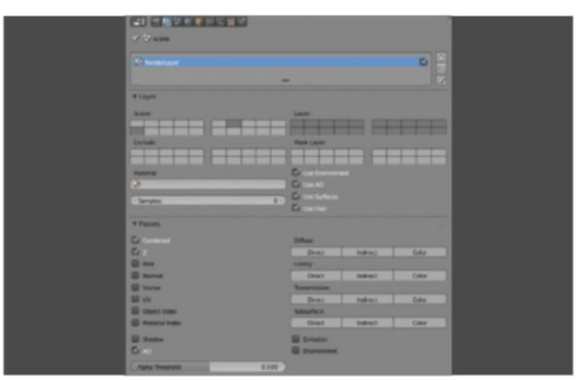
04 REFINING THE SCULPT

Once your pattern is done, use the Clay Strip brush to add thickness to the veins, following the wooden flow. The clay strips add interesting noise to the wood making it more natural. You can refine this with the Pinch brush to achieve a nice fall off in the veins' tails, and sharpen the peaks and valleys. Disable Dynamic Topology for this final stage to stop Blender from collapsing edges and creases.



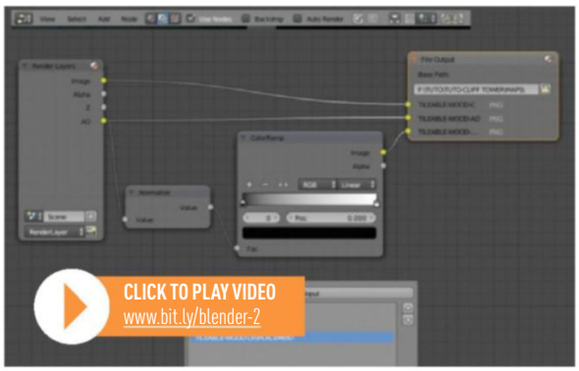
05 PREPARING THE TEXTURE EXPORT

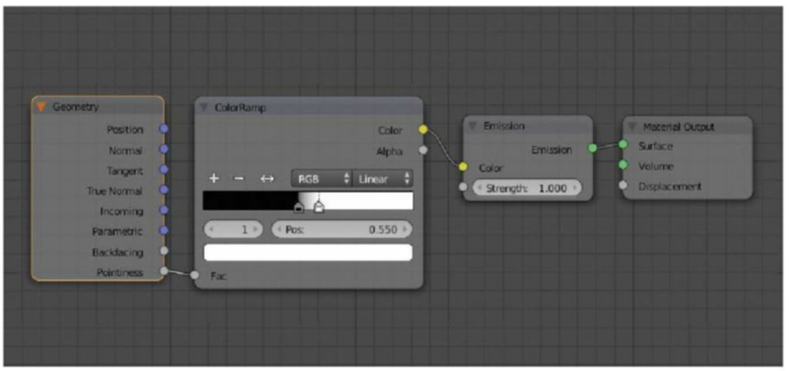
Instead of baking the textures from our sculpt we will use a rendering process that avoids texture distortion that's a result of the projection. Now we'll add a camera by pressing [Shift]+[A], and set its coordinates to X:0, Y:0 and Z:1. In the camera's Options menu, found in the Properties panel, set it to orthographic with a size of 2. This will define our orthographic limits based on our sculpting tile size.



06 SET UP YOUR PASSES

In the Properties panel, in the Render Layers panel, enable the AO pass, so we can export the combined Z and AO pass when rendering. In the Node editor, enable the Layer menu and check Use Nodes; add a File Output node and add two additional sockets in the N panel and name them properly. Also, set a path to your map folder.



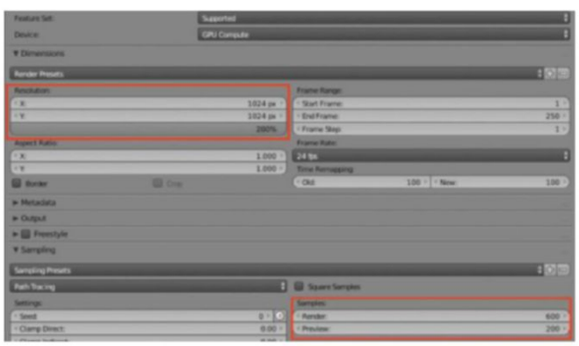


07 CONVERTING FOR OUTPUT

Plug the Z pass in File Output and you'll see a white picture. A Normalise node takes the lowest value output from Z path and sets to 0; the highest to 1. Middle values are taken the same way. Plug the result into a ColourRamp node to convert values to a grey scale image to input in File Output socket.

08 PREPARING OUR OBJECT MATERIAL

With our sculpted plane selected, go into the Node Editor and create a new material. Now add a Geometry node, a ColourRamp and an Emission shader. Use the Pointiness output and increase the contrast by moving the black colour ramp flag to 0.45 and the white to 0.55, and plug the result into the Emission shader Colour input. This will allow us to visualise the pointiness or 'cavity' attribute of our object.



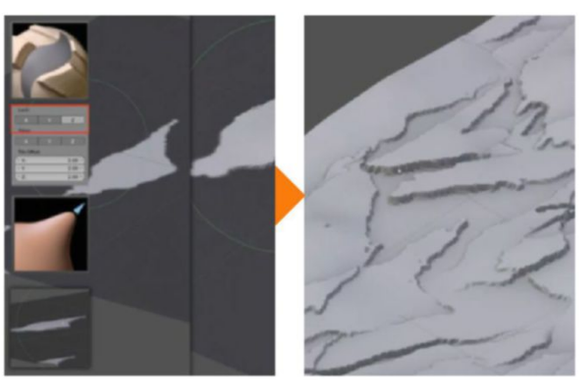


09 RENDERING THE MAPS

In the Properties panel set the render size to 2048x2048. You can set higher values manually or use the percentage factor: 1024x1024 at 200% = 2048x2048. Push the rendering sampling value to 500 or 600. The Z and Emission pass don't need a high value of sample – this means it will render faster. Click the Render button and your maps are ready to use in your Output folder.

10 CREATE THE NORMAL MAP

In the 3D viewport N panel, use the matcap and choose the normals matcap. Then we just need to make an OPGL render by clicking the camera icon in the bottom menu stack. This will capture our OpenGL viewport based on active camera properties. You now just need to save the image from the UV Image Editor. You can combine these maps with a wooden photo texture with subtle geometry information, in oder to create a nice shader of a stylised wooden material.





11 ROCK SCULPTING

To create our rock texture we'll repeat the same process as in steps 1 and 2. Then the trick is to mask areas of the plane and extract chunks of stone from its flat surface. So lock the X and Y axes and use the Grab brush to extract the surface. Repeat this process several times to get a complex surface that resembles a hard, rocky finish.

12 REFINE YOUR ROCK EDGES

Unlock the X and Y axes, then with the Scrape brush polish the rock edges to make them a little less sharp, with a nice broken pattern. Change your stroke size as often as possible to give the surface a more random and natural pattern. You can use the same Scrape brush tool to define bigger chunks on the flat areas.

Extra details

You can refine your surfaces by adding 'scares' and holes using the Draw brush, and refine edges and cavities using the Pinch brush. To get a better result with the Pinch brush, disable Dynamic Topology. You can then repeat the process from steps 4 to 6 and get your nice textures and shader.

ARTIST Q&A

Practical tips and tutorials from pro artists to improve your CG skills



Jason Knight
Jason is a freelance digital artist with over 33 years' experience, starting in 1983 with an award for art created using a Timex Sinclair 1000.
www.knightgraphics.daportfolio.com



Francis-Xavier Martins
Francis-Xavier is a character artist and CG generalist based in Brighton, with over a decade of experience in video games, media and TV.
www.polyjunky.com



Paul Hatton
Paul leads a studio of visualisers based in the UK. He delivers a host of projects including video and interactive environments.
www.cadesignservices.co.uk



Syawish A Rehman
Motion graphics and VFX artist from Pakistan with nine years' experience, Syawish loves motion graphics and making video tutorials.
www.facebook.com/theredpineapplearts



EXPERT TIP

RIPTIDE PRO PLUGIN

The native .obj import option in Cinema 4D does some strange things sometimes. Over the years, I have had great luck and success using the Riptide Pro Wavefront .obj file Import/Export plugin (**skinprops.com**) for Cinema 4D. This useful tool will save you some aggravation when working with .obj files.

GET IN TOUCH

EMAIL YOUR QUESTIONS TO
ian.dean@futurenet.com

SOFTWARE: CINEMA 4D | DAZ STUDIO

HOW DO I MOVE BETWEEN DAZ STUDIO AND CINEMA 4D?

Clarisse Billingtome, US

FOLLOW THE VIDEO
If you see the Play icon, use the



Jason Knight replies

Moving between programs can be confusing, and I tend to stick to these four food groups: Cinema 4D, ZBrush, DAZ Studio, and Marvelous Designer, to keep from going insane. Every program has its quirks and I seem to run into them all.

In Issue 213 (November 2016) I wrote about how I primarily work in Cinema 4D, but how I often move my characters in and out of DAZ Studio to take advantage of the many clothing options and features, especially the vast posing options. Many people have asked me how I move back and forth between the two programs whilst keeping the exact same character position, scale, and world coordinates/settings.

Unfortunately, the native .obj import option in Cinema 4D does some strange things when you try to use the default settings to open a file exported from DAZ Studio. The most notable is that your model comes in as a mirror image, completely flipped on the X axis. It may also change the scale of your model if you don't pay close attention to and adjust the scale on the .obj import panel.

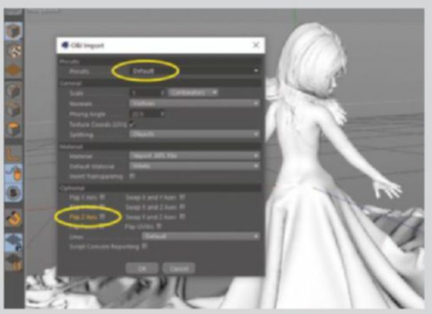
Over the years, I have had great success using the Riptide Pro Wavefront .obj file Import/Export plugin for Cinema 4D. I don't currently own a copy of the plugin, so I was forced to tinker with the built-in Import and Export options until I found settings that worked. Like most things, I am sure that there are several different ways to move between Cinema 4D and DAZ Studio, but in all my research on the topic, I haven't found a simpler method than the one I used to make my image Blue Jay.

For this image, I used DAZ Studio to pose my character and add the hair. The character was originally modelled in Cinema 4D and imported into DAZ Studio. Cinema 4D was also used to model the wings, harness, and the origami cranes (the dress and underwear are made with Marvelous Designer). I found myself moving back-and-forth between Cinema 4D and DAZ Studio a lot as I tried to model just the right pose for the wings.

The four-step process I present is the result of countless hours of trial-and-error.

STEP-BY-STEP FROM DAZ STUDIO TO CINEMA 4D, AND BACK



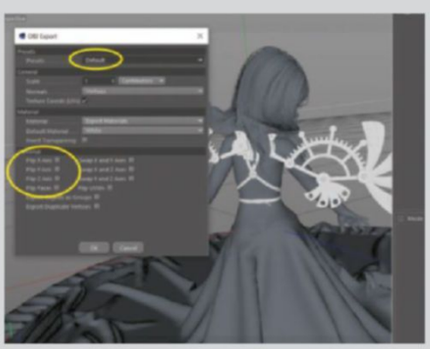


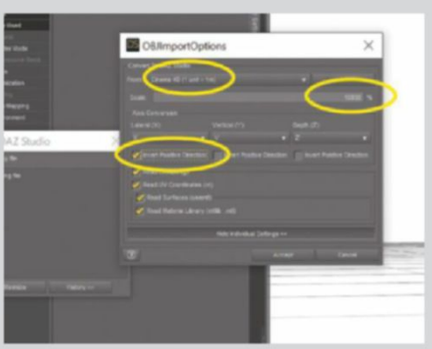
01 EXPORT FROM DAZ STUDIO

To get from DAZ Studio to Cinema 4D, start by clicking Export in DAZ Studio. Choose Wavefront Object (.obj) as the Save as type. On the .obj Export Options dialogue, select the Cinema 4D Preset from the dropdown list. Next, (and this is important) checkmark Invert Positive Direction under the X axis. The last thing to do here is to Disable Write Surfaces unless you plan to render in Cinema 4D and need the textures to transfer over.

02 OPEN IN CINEMA 4D

To open the .obj file in Cinema 4D, just click on the normal Open option on the file menu. Select the .obj file that you exported from DAZ Studio. The .obj Import dialogue appears. Choose the Default preset from the dropdown list and make sure to uncheck Flip Z Axis, if it is checked (this is another important step). Click OK and you should see your object in front of you loaded in Cinema 4D.





03 EXPORT FROM CINEMA 4D

To export from Cinema 4D back to DAZ Studio, click Export on the Cinema 4D file menu and choose Wavefront .obj from the list. Give your file a name and the .obj Export dialogue appears. Choose the Default preset from the dropdown list and double-check to make sure none of the axis options have a checkmark next to them. Click OK to export the file.

04 IMPORT IN DAZ STUDIO

Back in DAZ Studio, click Import from the file menu. Locate the file you exported from Cinema 4D and click Open. The .obj Import Options dialogue appears. Choose the Cinema 4D preset from the dropdown list. Make sure the scale is 10000 per cent. I still haven't figured out why it needs to be 10000 per cent, but that's what seems to work. Next, make sure to check Invert Positive Direction under the X Axis option and then click Accept.



EXPERT TIP

TRANSPOSE MASTER

When using Transpose Master, it's possible to save out the low-poly version T-pose mesh to disk. You can then use this as a rig of sorts and quickly pose your character whenever you need to make changes. Don't delete any of the original subtools though or you'll get an error message.

During sculpting it's vital to change materials and light position to make sure the sculpt looks good in different conditions

SOFTWARE: ZBRUSH

WHAT STEPS CAN I TAKE TO ENHANCE MY SCULPTS?

Anatoly Artuo, US



Francis-Xavier Martins replies

I'm going to talk about a few techniques I use when sculpting that help to make the final sculpt pop. I'll be using this sculpt of The Penguin (the concept is by Javier Burgos).

The sculpt itself was started using DynaMesh. I was able to quickly block-out the head and body using spheres. The hat I created by appending a cylinder using the ZModeler brush. Clay, Dam Standard and H-polish for the flat planes, and the Move brush to get the forms right.

From the concept you can see that The Penguin is apprehensive: The eyes are very important here. I tend to have two spheres; one concave for the pupil and one for the outer sclera. In my opinion it always sells the look when posed correctly because the light reacts as it would in real life.

Lighting is very important when sculpting. For this sculpt, I wanted harsh light for the final render, but during sculpting it's also important to change materials and light position to make sure the form looks good in different conditions. The colour of the light also tells its own story, so cool colours for a night time scenario were appropriate here.

I tend to use FiberMesh for hair or fur, but this time I decided to try it on his collar. I had a piece of geometry which I masked and used to generate the fibres. I turned up the randomness on the gravity to break up the uniformity of the fur. It always helps to change things up in a sculpt by having different materials instead of just clay all the time.

Posing The Penguin was straightforward using Transpose Master: Remember, as long as the origin of your transpose line is in the centre of your model, that's where it will rotate from.

I wanted the final result to be interesting so it always helps to have a bit of context or story, otherwise it's just a guy in a top hat looking to the left. If you look closely in his monocle, it's been smashed, alluding to a story behind The Penguin's apprehension!



SOFTWARE: V-RAY

HOW DO I CREATE A SEE-THROUGH CURTAIN MATERIAL IN V-RAY?

Majel Brynner, UK



Paul Hatton replies

See-through materials can be really hard to get right and yet they are so prevalent in our world that we have to learn to accurately represent them.

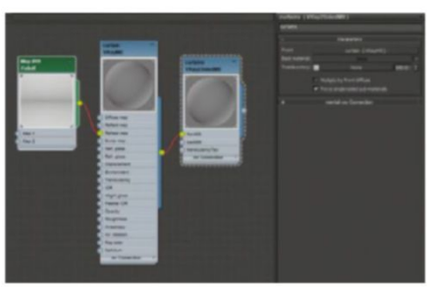
The first step is to be sure what properties your chosen material exhibits. You need to know how translucent it is along with how the light responds to it. Can you see more of the back side than the front side? Notice also how the translucency is not likely to be uniform, but instead becomes less translucent when viewed at an angle.

With that in mind, here's how I would set up a see-through curtain material like the one in the image. Firstly you need to create a V-Ray Two-Sided Material. This material is brilliant because it lets you plug in a V-Ray Material to both the front and back slots and then adjust the translucency based on a colour or a bitmap. (For the purposes of answering this question we'll use the same material for the front and back.)

Create a V-Ray Material and connect it to the front slot. Make the diffuse colour of this close to white and set the reflection colour to a mid grey. The closer it is to white the more reflective it'll be. We also want to spread these reflections out so that they are not too defined. Do that by adjusting the Highlight Glossiness and Reflection Glossiness to around 0.75. You can go higher if you want it more noticeably reflective or lower if you want the reflections to get lost over the surface.

As this curtain material is less translucent when viewed at an angle, I to need to put a Falloff map inside of the Refract map. In its parameters set the first colour to be a 190 grey and the second to be a 110 grey. Set both these to 50 per cent.

This will give you a good grounding for this type of material. You can then adjust how reflective and refractive it is as well as inserting a pattern to the diffuse slot to make it more interesting.



Create transluscent materials using a V-Ray Two-Sided Material

EXPERT TIP

DON'T TRACE REFLECTIONS

Probably the best piece of advice I've ever heard about creating this type of material is to not trace reflections when you don't need to. If perfectly accurate reflections are not required then simply go into the Options rollout of the V-Ray Material and uncheck Trace Reflections.



SOFTWARE: MAYA

HOW CAN I RECREATE THE NEW JET BLACK IPHONE LOOK?

Richard Waquakri, UK



Syawish A Rehman replies

Jet Black is the latest look for the iPhone family. They're saying that it's blacker than black in some way and there's a complicated process that an iPhone goes through to get the Jet Black look. We're not going to go into any of that; I'm just simply going to show you how you can achieve that same super-shiny, jet-black look. I'll be using Maya to demonstrate how to do this. There's nothing complicated in this tutorial, and you could use any 3D application to create this, since all applications have the same features that I'll be using.

Most people think that a look is just about the material that's applied to the model, but it's not just that. It's the geometry of the model, it's the lighting setup, it's about thinking about the reflections, how and where will they fall.

For this tutorial, I'm going to show you how to create a product shot that might be used for advertising purposes: I'm going to create a studio setup rather than an outdoor environment, but you could choose to do either. If you do choose to set up the scene outdoors, remember that the lighting will be less than ideal: having colorful reflections is not recommended to get this particular look.

Realistic lighting and texturing is the key to photorealism in creating a shot like this: The lights should be kept big and at a distance to properly light the scene and capture some of those great reflections. Sometimes, you can also apply a noise texture to the reflectors – remember to experiment with this as the results can be varied and its use depends on what you're trying to make.

You could use HDRI Studio Map, or a software like this, to design an environment



map which you can use for both lights and reflections, and which is a bit lighter on the rendering time and can also be used in a PBR type situation. I used V-Ray for this tutorial, but you can use any rendering engine you like, it's a fairly simple process.

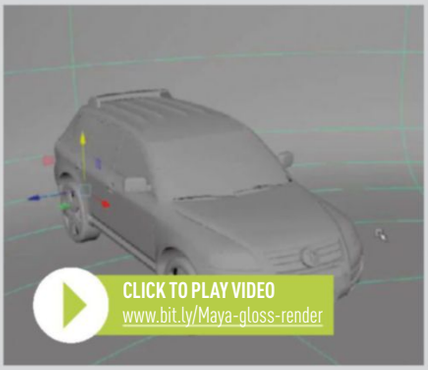
Something else, I wanted to draw your attention to is the falloff-softbox-type effect in the video. You should certainly try that as well. Using softboxes can really change the overall feel of the product as you see the reflections fade off, rather than end abruptly. Again, experiment, to see if that's the look you want.

EXPERT TIP

AVOID SHARP EDGES!

Lighting the scene really depends on how your geometry is set up. As I've written in the tutorial, sharp edges don't capture light from the sides well, so try to avoid that or resolve that issue if possible. On a black background it's really important to show the sides of the product.

STEP-BY-STEP GET THE JET-BLACK LOOK



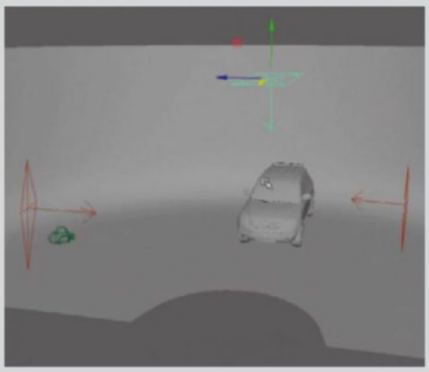


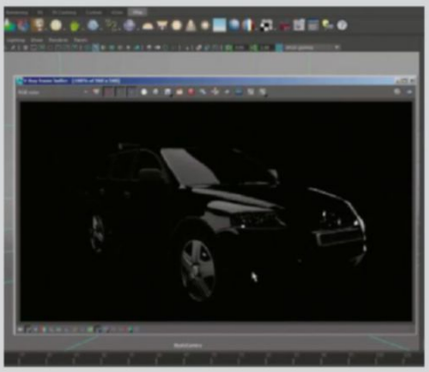
01 SETTING UP THE GEOMETRY

A model's geometry plays a vital role in how the object captures reflections. If it's got some really sharp edges then it won't capture the right reflections, that's why setting up a chamfer-style edges is essential to capture the lights' reflections. So if you have a model you want to display, try softening it's edges, but if you can't do that, then simply set it up at a 30-45 degree angle from the light you want to capture.

02 CREATING THE MATERIAL

Creating the material is pretty straightforward, it's not really about the material as much as it's about the lights and reflections. So simply create a VRayMtl (if you're using V-Ray). Set the diffuse to black, turn on the fresnel reflections, ramp up the reflections all the way to 100 and you're good to go. Do not use any bump or displacement maps, they'll just end up ruining the look.





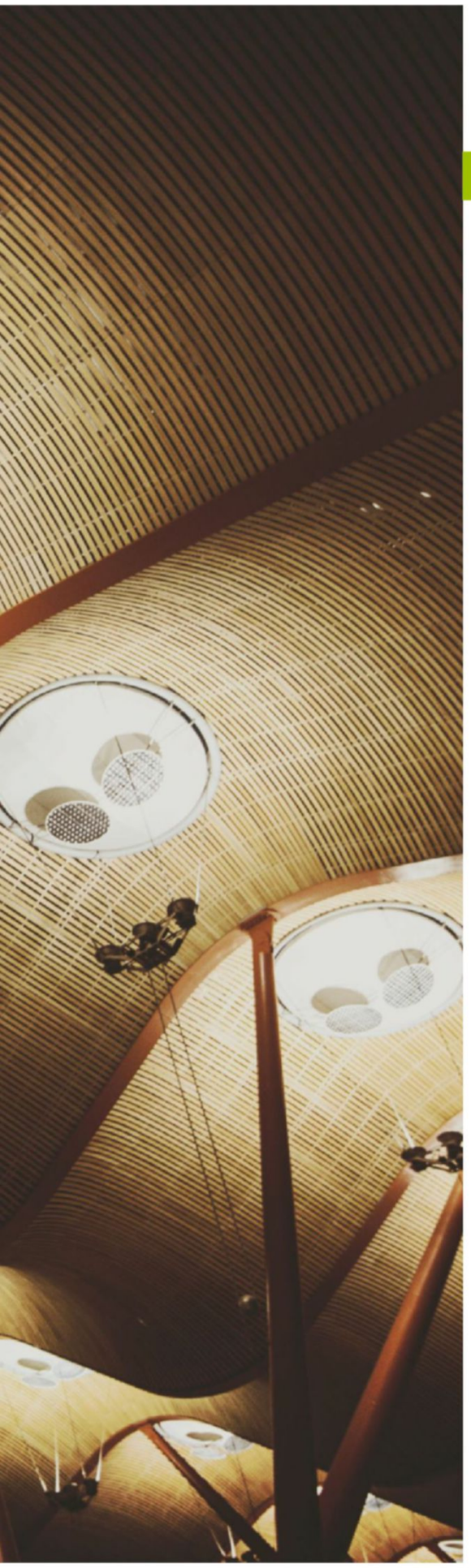
03 LIGHTING THE SCENE

Lighting is by far the most important part of this entire set up. If you have an iPhone model or something similar try lighting it up from the sides first. In this example, we have a car and for that I used really big lights and set up two of them, one on the top and the other one in the opposite direction to the camera.

04 SOFTBOX EFFECT

Quite often in a studio set up people use softboxes to light their scene, if you want to achieve that look, simply apply a texture to your scene, make it one of those fall off textures you can find in 3ds Max or simply use a ramp made in Photoshop. Using softboxes create a really good look, but I couldn't quite make it work for the jet-black look.





SOFTWARE: V-RAY

HOW CAN I RECREATE THE LIGHT DISTRIBUTION FROM REAL LIGHTS?

Gaval Stickerman, US



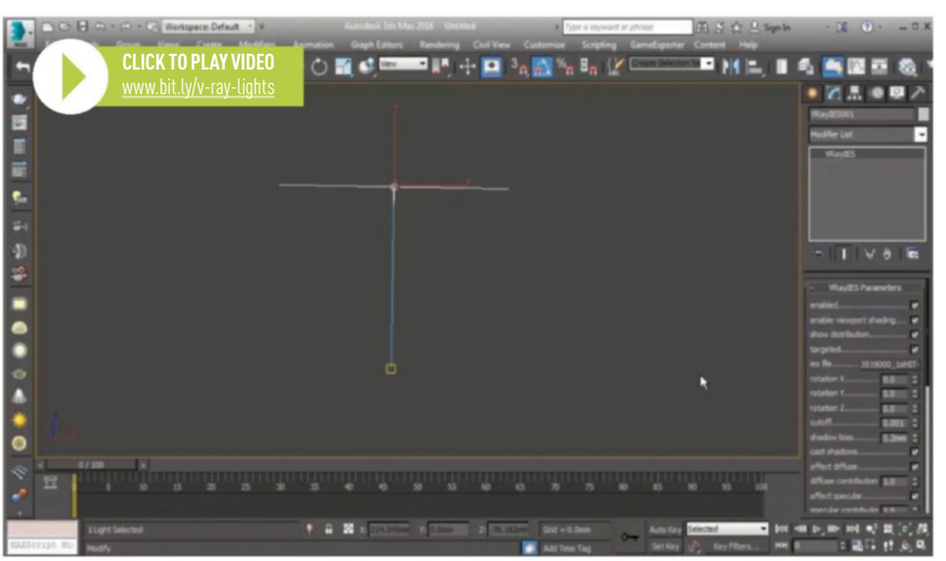
Paul Hatton replies

This is a great question. If you turn on a light or go onto Google and search 'Lights' then you'll see that internal lights have specific and bespoke light distributions. The way that the light falls off and distributes out from the bulb is unique to each bulb. This effect isn't something that can be recreated using a standard light but can instead be created using something called an IES file. These files contain the exact distribution of light for a specific lamp. Thankfully most lighting manufacturers will provide these files free of charge from their websites. To find out what the light distribution of a file is you can use a nice free viewer called 'IESviewer,' which can be downloaded from their site at **www.photometricviewer.com**.

Once you've got the IES file that you need we can begin to load it into our 3D software. For the purposes of application we're going to focus in on V-Ray but you can apply these principles to any 3D software which allows it.

Firstly, head over to the Create panel and to Lights followed by VRay. Select VRay IES and drag the light in the viewport to create it. Then head over to the properties panel and scroll down to the VRayIES Parameters rollout. The specific parameter you need is entitled 'ies' and it has a button next to it which by default will say None. We need to insert into this parameter the IES file that we previously downloaded. Click on the button and it will bring up a dialogue box. Navigate to where your IES file is stored and double click on it. That will then be loaded into your light. Do a quick test render and see what the result is.

If you want to further customise the light then in the properties section you can also adjust things like the power of the light and its colour. You shouldn't have to change many (if any) of the properties because IES lights should work pretty well out of the box. The only properties I generally change are the power of the light and its colour.



Decide what type of bulb you want, then download the IES file, load it and make any adjustments you need

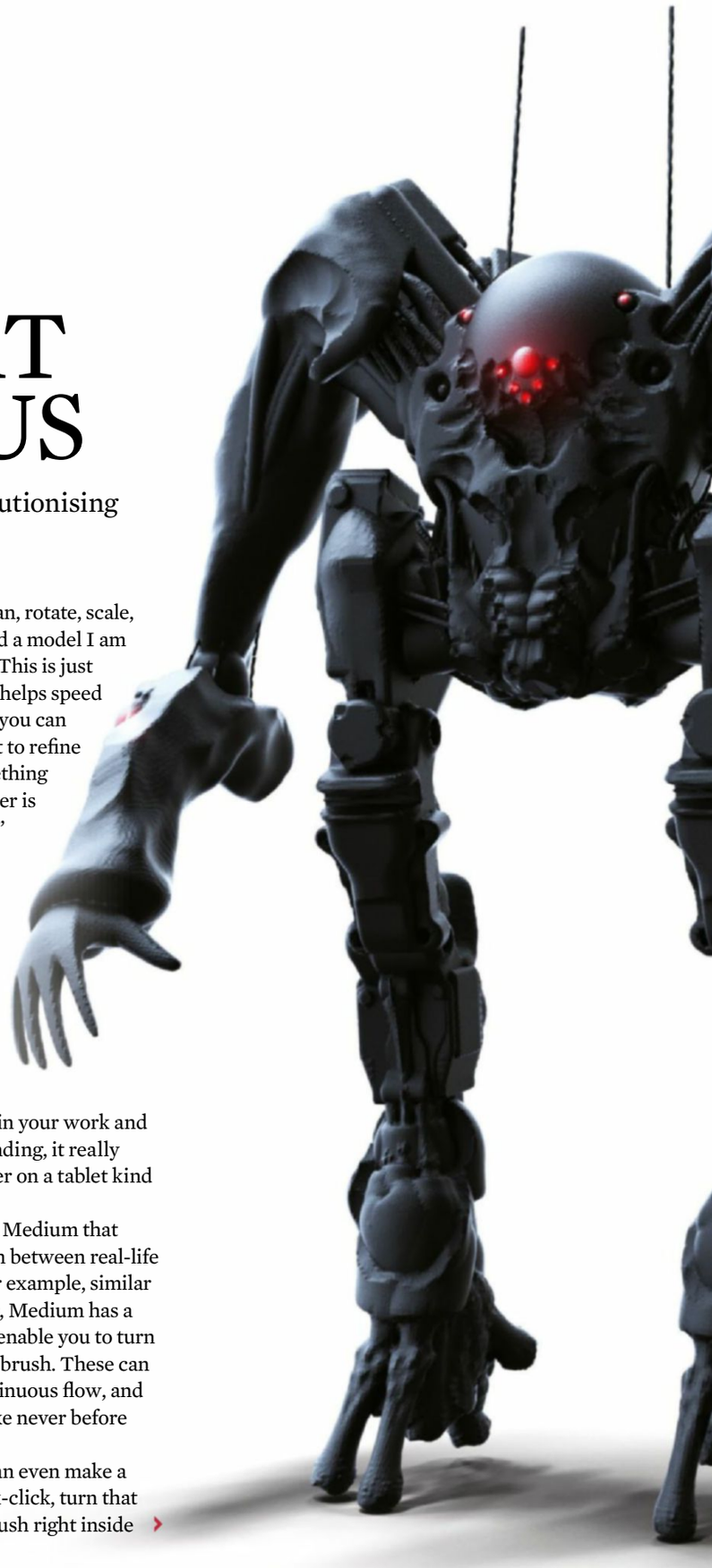
INSIGHT

News and views from around the international CG community

EXCLUSIVE REPORT

CREATING ART INSIDE OCULUS

Artist **Steve Teeple** reveals how virtual reality is revolutionising the way 3D art can be created, using Oculus Medium



The arrival of VR is changing the way we experience entertainment, but it also has the potential to change the way we create. This December sees the launch of Oculus Medium, a sculpting app to use inside VR that could change how we work.

"For me sculpting in VR with Medium helps remove a lot of technical barriers for artists," says concept artist Steve Teeple, who's been using a beta version of Medium for some time. "You are thrown into a scene with a grid, a skybox, and two controllers. It feels like a sculptor standing in front of a block of stone... there is no crazy interface in your way or menus to set up, you can just boot it up and start sculpting."

Within limits

While Medium has limitations over software like ZBrush, it's seen as a plus for Steve: "I find limitations in art can do wonders for our creativity and when you only have two hands with a limited number of buttons it makes digesting the menus and tools so much easier. Honestly, I was able to dive right into Medium and start making things fairly quickly as it just seems to make sense if you have used any 3D app before... Anything that removes those technical barriers and gets more people making things just pushes our industry forwards."

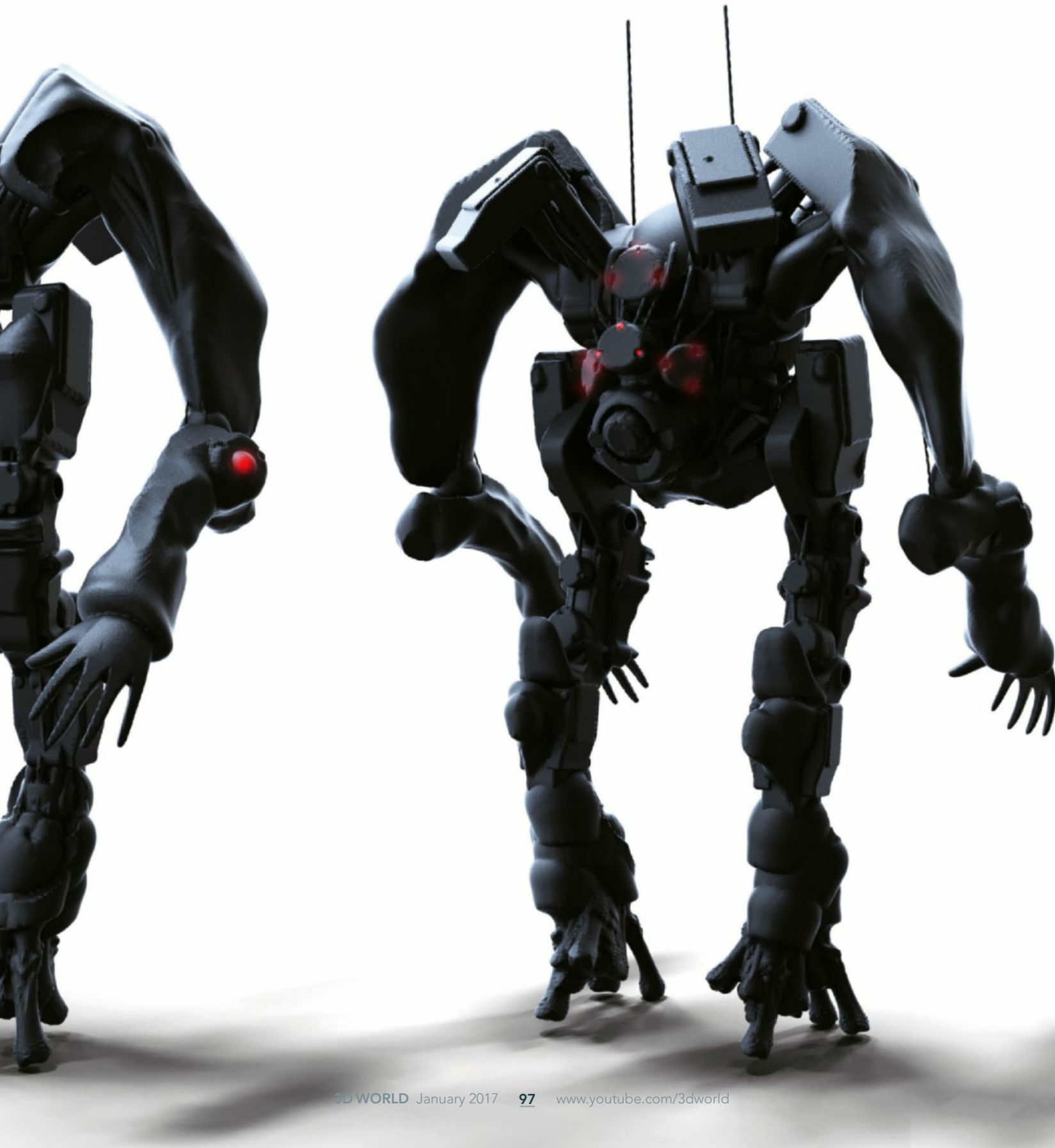
For Steve, Medium is the realisation of those Hollywood visions we're all used to; just like Tony Stark we can all now navigate floating computer interfaces. "I get to sit or stand at my desk and pan, rotate, scale, and physically look around a model I am working on," says Steve. "This is just such a surreal feeling and helps speed up your workflow a lot as you can start to see areas you want to refine quicker, or can scale something to life size so your character is staring at you at eye level."

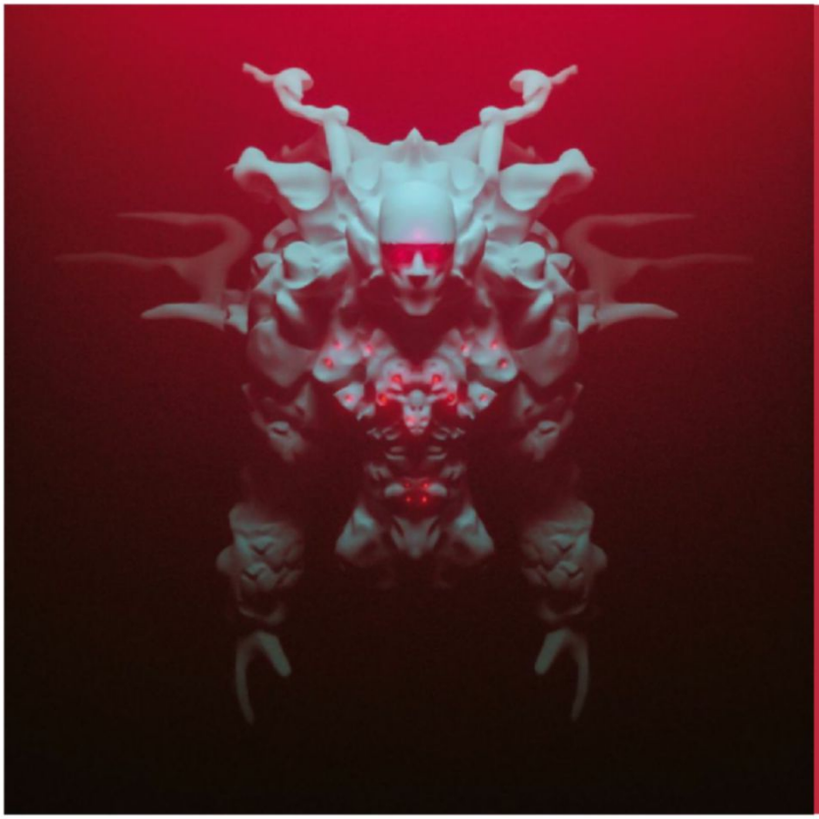
The result for Steve is Medium gets closer to feeling like traditional scultping, as he explains: "It honestly feels much closer to actual sculpting in the real world compared to using a stylus. You are using your whole body to make bold movements in your work and when combined with standing, it really removes this hunched over on a tablet kind of workflow."

There's a familiarity to Medium that means it treads a new path between real-life sculpting and ZBrush. For example, similar to ZBrush's IMM brushes, Medium has a set of stamping tools that enable you to turn any model or shape into a brush. These can then be turned into a continuous flow, and you can explore shapes like never before in other applications.

Steve explains: "You can even make a sculpt and then, in a quick-click, turn that shape into its own new brush right inside ›

"I keep my Rift and Touch controllers right next to me at my desk and go back and forth between the app quite regularly, so much so that it's become part of my normal workflow," says concept artist Steve Teeple





THE RESULTS ARE IN

Steve Teeple explains how Oculus Medium's end results measure up against ZBrush

"While you probably won't find any 15+ million poly ZBrush-like sculpts, Medium excels in its own ways with presenting your work," Steve explains. "You have the ability to add in things like emissive or metallic textures, paint directly on the model and blend colours with ease, record videos or photos in the app, and do turntable animations in one click."

Combine these feature with Medium's ability to smooth and up-res sculpts, or export to other apps, Medium can hold its own when it comes to a polished look.

"I have been exporting a lot of my sculpts from Medium into KeyShot or Octane Render and with very few tweaks it is very close to the fidelity most artists would like to achieve," says Steve. "It has been really exciting posting pieces that, to me, look almost exactly like something I would do in my normal workflow, but when I know that it was fully sculpted in VR there is a certain magic there."

the app and start exploring new forms quickly. I have made entire pieces in Medium from using a human torso shape as my brush for example, but you would barely tell that's how it was used on seeing finished piece. I use this technique in every piece I create, and it removes so many barriers while allowing for a lot of experimentation, and happy accidents, which I love when creating. For concept artists I think this will be incredibly powerful for starting with this technique for initial explorations before taking further into the pipeline."

Steve sees Medium has an effective, practical tool for professional concept artists, game designers and illustrators.

"Its less technical, more creation-based approach will empower many creators who are new to 3D, to pick up a tool that can help them visualise their ideas without worrying about learning some crazy 3D package that is over their head," says Steve. "I see game designers using this to quickly block out scenes or storyboards for their worlds, or quickly sketch out how a character could look before handing it off to someone for further polish. Illustrators can quickly bash out some forms, shapes, characters, and environments to then export and paint over to help speed up their process."

While Medium is still new (set for release in December), it offers a glimpse of what this tech could do for the CG industry in general, in the future. "If you really think about it, designing something in 3D on a flat screen does not make much sense compared to seeing it at scale in front of you where your movements match up to what you are looking at. It feels like the missing link with creating artwork in three dimensions that so many of us have been waiting for," says Steve. "My mind is already racing with what will change as hardware gets more compact, controllers get more refined and closer to our hands, and computers get more affordable and powerful. A lot of these things are already in our near future, so I expect to see this app ramp up quite extensively over the next few years. Exciting times."



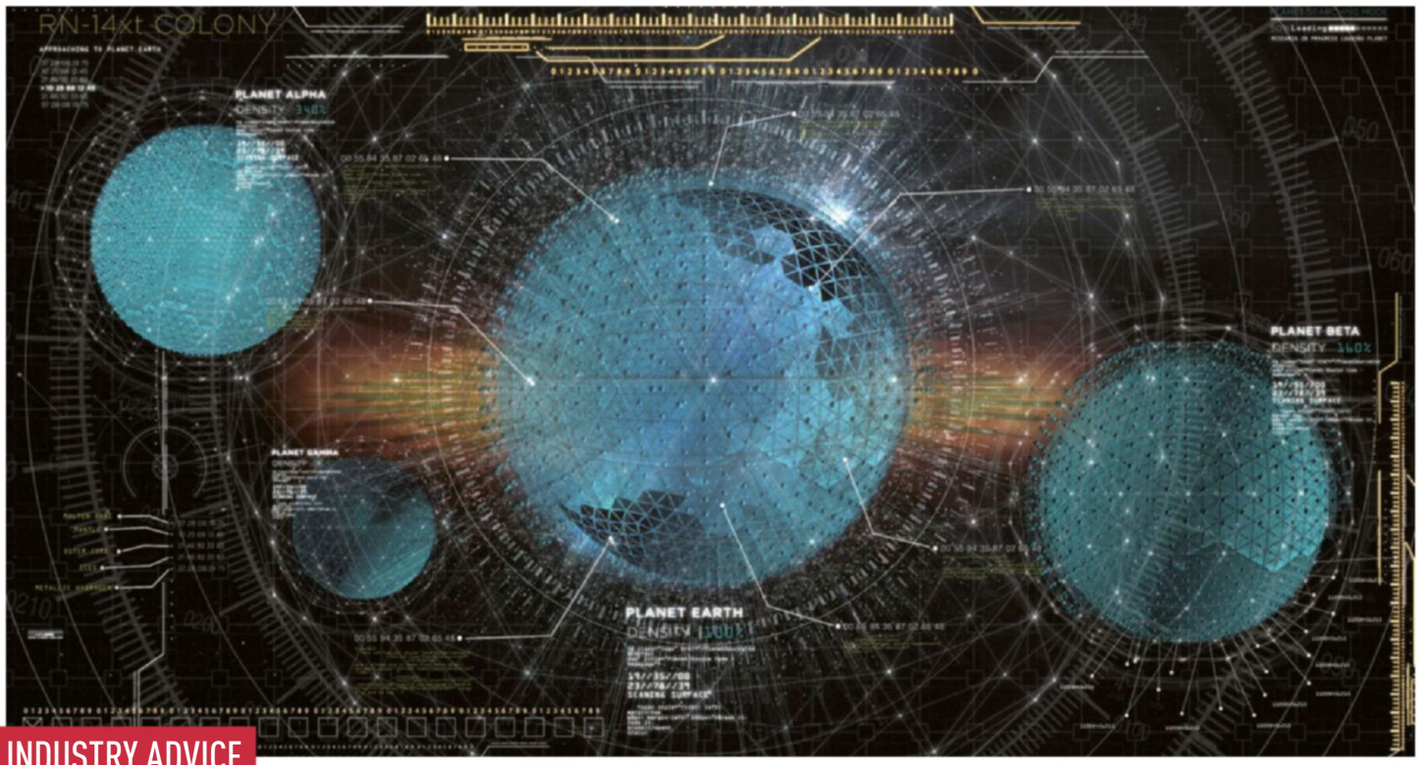
ANYTHING THAT REMOVES TECHNICAL BARRIERS AND GETS MORE PEOPLE MAKING THINGS JUST PUSHES OUR INDUSTRY FORWARDS

Steve Teeple, concept artist and Medium user

FYI *Next issue, Oculus Medium tutorials.*



Medium's simple Clay tool, used to create this creature, enables you to repeat patterns and build interesting sculpts in a short space of time



INDUSTRY ADVICE

HONE YOUR MOTION GRAPHICS SKILLS

Escape Studios' Head of Motion Graphics, **JM Blay** shares his advice for getting ahead in motion graphics

There are constantly new and unique developments in the fast moving CG industry. With new software updates arriving all the time and fresh techniques to hone, it's important to stay on top of your game.

As head of motion graphics at Escape Studios, and also an independent director and motion designer myself, I have more than fifteen years of experience working on advertising, films, TV, video games and multimedia for clients such as NBC Universal, Paramount Pictures, Warner Bros.

From my experience I have pulled together some top tips below to offer advice on how to really hone your motion graphic skills, to take it to the next level.



BY BREAKING THINGS DOWN AND PERFECTING YOUR SKILLS, IT WILL ENABLE YOU TO REALLY SEE WHAT MIGHT NEED CHANGING

JM Blay, head of motion graphics, Escape Studios

1. Don't be afraid to make mistakes

The creative process is all about trial and error. It's important to brainstorm your ideas and sketch them out on paper to really work through each element. By breaking things down and perfecting your skills, it will enable you to really see what might need changing, ultimately speeding up the process. It will also help you save time working on it in later with the software's.

2. It's not just about one set of skills

This may be obvious but it's really important, throughout your motion graphic work you will need to have a strong knowledge of graphic design and as much knowledge of filmmaking as you can get. Giving yourself this knowledge will ensure you are ready for any challenge that may come through.

3. Become an expert in Typography

A motion graphics artist should have a strong understanding of typography. Type is widely used as a form across motion graphics and it maybe in some cases that this is all that's used to convey the product to the audience. So it's important to understand what the audience will engage with, ensuring that the graphic stays with them.

4. Experiment with 3D

As well as 2D, it is now more important than ever that artists really build their knowledge in 3D and how this can be used in the design process. With the industry constantly changing, its key to really hone your skills in this area, in order to offer a wide range of options and ensure you can constantly deliver new and exciting work.

5. Inspiration is everywhere

Remember to focus time on exploring new trends and techniques to draw inspiration from; know the industry and understand what game and film studios are delivering. Digest other media, books, films, TV to draw on trends in order to ensure your work stays at the top of the game.

FYI *Find details on JM Blay's Motion Graphics course at* **www.bit.ly/jmblay**



Emily Carew Woodard's illustration style was the main inspiration for the animated short

ANIMATION INTERVIEW

ANIMATED ANIMALS

Director **Craig Wilkinson** tells **Kerrie Hughes** how a Mixamo and Maya pipeline provided the perfect solution for animation, Beware Strangers Bearing Gifts

Believe it or not, making good money choices isn't all about how much you should spend on your next tablet or 3D software package. In fact, it's such an important subject that The UK Sustainable Investment and Finance Association (UKSIF) runs an annual campaign, Good Money Week, to raise awareness of sustainable, responsible and ethical finance.

"In order to highlight the event this year, the team at UKSIF contacted creative studio Taylor McKenzie to create a promotional video. It was then that the task of writing, directing and animating a video to promote 'Finance for a Better Future' fell at the feet of Taylor McKenzie director Craig Wilkinson. And the result culminated in 'Beware Strangers Bearing Gifts', a beautiful allegorical tale that follows a young couple as they embark on a journey to undo the perils brought on by some hasty financial decisions.

First things first

Inspired by the work of illustrator Emily Carew Woodard, whose work is reminiscent of Arthur Rackham, Craig quickly decided on the film's unique, stylised look. "I love Emily's work," he says. "Her illustration style was the main inspiration for the film. There's a spooky, otherworldliness to it which we thought would resonate with the target audience; millennials embarking on their first financial journey."

Next came the main challenge; creating a coherent, (almost) four-minute film in just six weeks and on a very tight budget. But after considering his toolset, Craig came up with a highly time-efficient and cost-effective pipeline to get the job done. "We needed to have a solution that facilitated delivering the message in the most convincing way possible, quickly," he explains. "Fuse has these great character-building tools, maybe not for everything,



THERE'S A SPOOKY, OTHERWORLDLINESS TO IT WHICH WE THOUGHT WOULD RESONATE WITH THE TARGET AUDIENCE

Craig Wilkinson, director, Taylor McKenzie


Maya 2017's Time Editor proved an essential tool


The animation has a magical quality


Pre-made TurboSquid animal heads were added to bodies created in Fuse

but if you have a deadline, and you know what you want, you can certainly get a long way. It was fortunate that the clothing required very little customisation to fit with Emily's style too."

Using the bodies they had created in Fuse, Craig and the team mixed them with models of animal heads from digital media marketplace TurboSquid before importing the characters into Mixamo for rigging. "The animated rigs on Mixamo are really nice," Craig comments. "And, luckily, what was available suited our needs perfectly. The integration with Fuse is pretty seamless too."

Time-saving tools

Refining their workflow as they went along, the team worked on creating an effective process to finish the project on schedule. "We built a master model in Maya for each character using the Fuse model, augmented with the TurboSquid animal head, which we constrained to the Mixamo rig using Maya constraints," says Craig. "We were able to then source and import the required animation from Mixamo as an .fbx file and swap it out in the Maya master rig to give us the desired animated character. The model with animation was then imported to the relevant scene for lighting."

Throughout the project, one tool proved useful. "We used the new Time Editor in Maya 2017 to sequence the animated clips where necessary," says Craig. "It was a great help where the animation clips from Mixamo weren't the right length or speed. Retiming clips, plus adding holds and cycles quickly was really useful."

FYI *Watch the full animated short at* **www.vimeo.com/189345527**

ANIMATION TIPS

CRAIG WILKINSON SHARES HIS ANIMATION ADVICE

1. PLAN EARLY

Know what you're trying to achieve creatively before you start. Sounds obvious but it's all to easy to jump in too early. A clear idea of the style you're going for before you start is invaluable. The technical stuff is hard enough, you don't want the creative messing with things too.

2. WORK EFFICIENTLY

As for the technical aspects of the job, Abraham Lincoln said "Give me six hours to chop down a tree and I will spend the first four sharpening the axe." Prepare well with lots of R&D and establish a clean workflow.

3. THINK CREATIVELY

Don't expect to get everything in one beauty pass out of Maya. Sometimes it's far quicker to do things in post. Motion blur for example, or depth of field. Use render passes to help you with this. A depth pass will give you the data required to do depth of field effects, matte passes will help isolate objects in order to add effects to them in post, too.

4. WORK THE STORY

Writing is rewriting. If you're working for a client, then make sure they are completely on board with the script before you go to CG. Do plenty of animatics too, so there's no surprises for them. And make sure you're clear with them about what to expect. Managing expectations is such an important part of the job.

5. STUDY OTHERS WORK

You'll benefit massively from building a mental repository of great animation/CG/VFX when the time comes to do your own projects. There's nothing new under the sun, but the more eclectic the reference you have floating around in your head, the more unique your work will be when you channel it.





Framestore used Houdini and Maya for fluid sims: "Now that Maya's fluid dynamics kit is so impressive we tend to use it for anything that's organic such as cloud-based work," says VFX supervisor Ivan Moran

VFX INSIGHT

ARRIVING AT THE SHOT

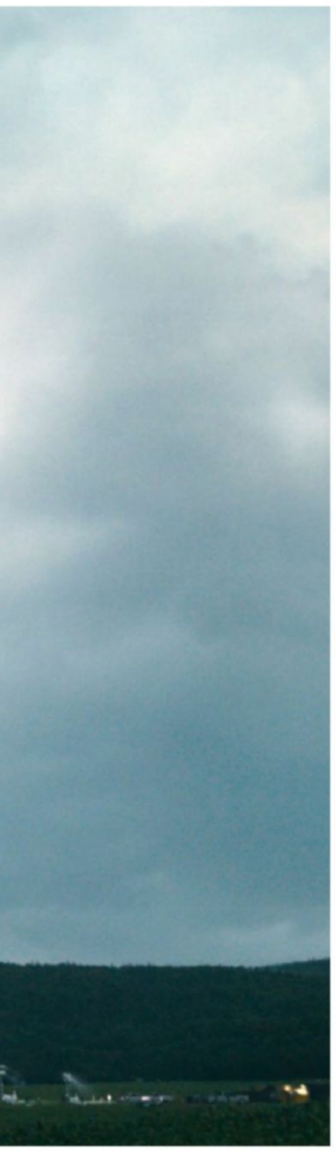
Trevor Hogg meets Framestore's VFX supervisor **Ivan Moran** to discover how a fleet of alien spacecraft vanished in Denis Villeneuve's epic sci-fi movie, Arrival

Arrival features a series of 12 alien spaceships in the shape of obsidian stones appearing throughout the world. The final 10 shots of the sci-fi movie needed to be reconceptualised so VFX supervisor Louis Morin hired Framestore to execute the ships' departure sequence.

"Our biggest challenge was selling the idea of scale," notes Framestore VFX supervisor Ivan Moran. "These ships are over a thousand feet long, but devoid of any recognisable external architecture that could assist us with scale. On top of that we wanted to have them disappear in a way that didn't feel too arbitrarily tricksy or magical. I came across a couple of natural phenomenons that I thought would work quite well. One is called a condensation effect, which is a sudden drop in temperature and pressure that sometimes occurs when aircraft are coming in to land and you get incredible rolling fog banks along the wings, which in some cases can envelop the whole back of the aircraft. I thought that was a cool way of helping to disguise the ship by covering it with a natural cloud-like phenomenon so it's not literally dissolving off of a plate, but instead melding with the clouds in the sky."

The condensation effect is often accompanied by a low-temperature mirage effect called a Fata Morgana. "Using that mirage effect allowed our compositors to prevent anything feeling like a straight dissolve because I was able to break up the ships into interesting patterns," says Ivan.

Keeping this effect as slow as possible helped make the alien ships feel mysterious. "We ended up doing a test that was mastered to about 30 seconds which Denis loved. It was happening so slowly you couldn't tell where it all was coming from, nor quite what was happening, which was perfect. The test shot happened to be on an overcast day. All of the other locations had different lighting and cloud covers. We finely tuned the mirage and



Nuke was utilised for compositing with Arnold for rendering: "We did have digital matte paint artists to help us with some of the backgrounds in the other shots," says Ivan Moran. "Maya is our package for 3D but it's heavily based on our own toolsets."





BUILDING THE ENVIRONMENTS

Framestore's VFX supervisor Ivan Moran explains world building

Along with the disappearance of the alien spaceships, Framestore did some environmental work for Arrival.

"Choppers are flying towards the ship and there's a huge standoff," remarks Ivan Moran. "We did quite a few shots in that sequence that were entirely CG. One shot is from behind a chopper in the engine exhaust slipstream, which is all CG and a particular favourite of mine."

There's also an almost-POV shot from a helicopter pilot where Framestore built the cockpit and all of the instrumentation. "In those shots we took matte paintings from the other vendors and did a panorama for the background. We never created an environment from scratch but used existing material," explains the VFX supervisor.

There was another disappearance shot created by the team, which wasn't a plate: "We modelled buildings ourselves and projected the supplied digital matte painting in order to do an interesting camera move on it that didn't feel static," explains Ivan.

condensation effects so they were based on the same idea, but had slightly different looks depending on the weather conditions in the plate. For the sunset ones you got to do some beautiful key lighting as the clouds begin to form and cover ships. Then in shots where there were no clouds, the simulations we ran were more cirrus-based."



IT WAS EXCITING TO GROUND THE SHIPS DISAPPEARING INTO SOMETHING THAT IS BASED ON REALITY

Ivan Moran, VFX supervisor, Framestore

Four to five different high-resolution fluid simulations needed to be produced per ship. The key was running these simulations at 48fps for scale. "The project was finishing so we knew we were going to have to use a lot of compositing work to choose bits of simulations from different versions and marry them together," says Ivan. "Covering the ships with these condensation-based clouds worked perfectly in disguising the ship, and allowed them to disappear in an interestingly organic and complex way."

The surface of the ships couldn't be reflective, Ivan explains: "We used physically plausible shading techniques so as the clouds crept over they affected the surface of the ships. It wasn't a straight reflection but more of a subtle shadowing. The mirage effect led the clouds; it was always in front so you didn't have white clouds covering a black ship which would have been difficult to integrate."

The ship asset was created by Oblique FX, which meant Framestore needed to do an asset diagnosis, rendering some frames close up and at distance. "We had a fast two- or three-day turnaround to make sure that we could render the ship in shots and it would match," comments Ivan.

Ivan explains repetition became a hurdle to overcome: "If we had to watch 12 ships slowly disappearing, the audience could potentially become bored. We worked closely with Joe Walker, the editor, in coming up with a plan. I had the idea of advancing the edit a little bit so if the whole event is 30 seconds we've compressed it down to 10 seconds by subtly jump cutting our way through. We repeated that again but jumped cut quicker until the moment when you wanted to see the whole thing. The ship in Montana comes on, which was our test shot: It's about 20 to 30 seconds long and you get to see the entirety of the effect," says Ivan, adding: "Even though Arrival is a science fiction film it was exciting to ground the ships disappearing into something that is based on reality."

FYI *See more Framestore's VFX work at* **www.framestore.com**



This model by Zhelong Xu is available to download from Allegorithmic's Substance Source library and reuse, for free if you have a Substance Live subscription

SOFTWARE NEWS

THE NEW SOURCE OF GREAT MATERIALS

Allegorithmic's **Dr. Sébastien Deguy** explains why Substance Source is a game changer for texture artists

While Substance Painter has become a staple for many 3D artists, there's always room to improve. So, Allegorithmic has launched Substance Source, a new online material library that offers users of Substance Painter 1.4 access to pre-made, customisable, physically based materials. Some are based on scans of real-world materials, while others are hand-painted or created proceduarally to get the best possible finish.

"Beyond having the best tools, artists also need inspiration, whether this consists of samples, references, or elements that can be customised and remixed," says Dr. Sébastien Deguy, founder and CEO of Allegorithmic. "Substance Source is a new but fundamental component in the Substance ecosystem, which means that artists have everything they need in one place and are freer to concentrate on what truly matters."

To showcase the materials on offer at launch Allegorithmic turned to seven professional artists, each used existing materials in Substance Source to create unique, production-ready assets – for example, Zhelong Xu's stunning dragon





Substance Source features pre-made assets as well as hand-made and photoscanned materials

render on these pages, inspired by Japanese illustrator Katsuya Terada.

Currently Substance Source exists as a standalone online library and is free to use for Substance Live subscribers; you can find it on a section of the Allegorithmic website at **www.source.allegorithmic.com/#/substances/home**. In time, Allegorithmic will make the library accessible from inside Substance Suite tools, with Substance Source materials being downloaded directly to your shelves.

As the library grows over time, Allegorithmic hopes Substance Source will become an invalueable resource for artists looking to use and reuse materials.

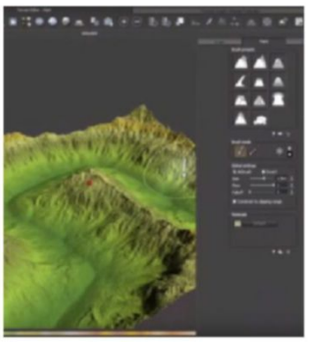
New assets will be added continuously to the library, and thanks to an implementation of Sketchfab's 3D visualisation technology, Allegorithmic says artists can look over assets from any angle before committing to downloading them.



ARTISTS HAVE EVERYTHING THEY NEED IN ONE PLACE AND ARE FREER TO CONCENTRATE ON WHAT TRULY MATTERS

Dr. Sébastien Deguy, founder and CEO of Allegorithmic

FYI *Find out more about Substance Source at* **www.allegorithmic.com**



VUE 2016 LAUNCHES

Vue has been a mainstay of the VFX industry for many years and with this new release, Vue 2016, E-on looks to rekindle the suite's affections in the industry. Integration is king this year, as now almost all assets, including full scenes and EcoSystem populations, can be exported. Plus, the xStream Convert tool means scenes can now be rendered with any renderer, such as RenderMan, Arnold, Octane, and V-Ray RT. A hybrid GPU/CPU Interactive Path Tracer also enables GPU rendering. Find out more at **www.e-onsoftware.com/news**.



PLANTFACTORY GROWS IN DEPTH

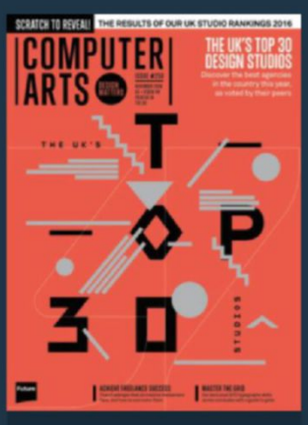
Hot on the heals of Vue 2016 is news of PlantFactory's new release. The 3D vegetation modelling, animation, and rendering software used in the CG, VFX, architecture and gaming communities comes of age in PlantFactory 2016, with new features that include Growth Simulation, which creates geometry inspired by organic growth. Read more here: **www.plantfactory-tech.com**.

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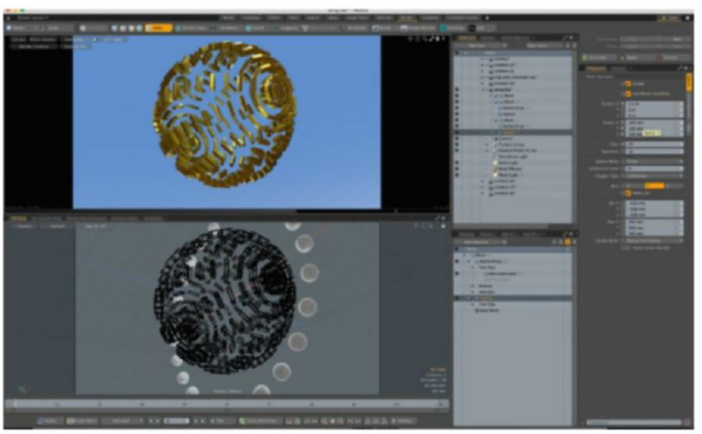
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We test the latest new software and hardware for CG artists



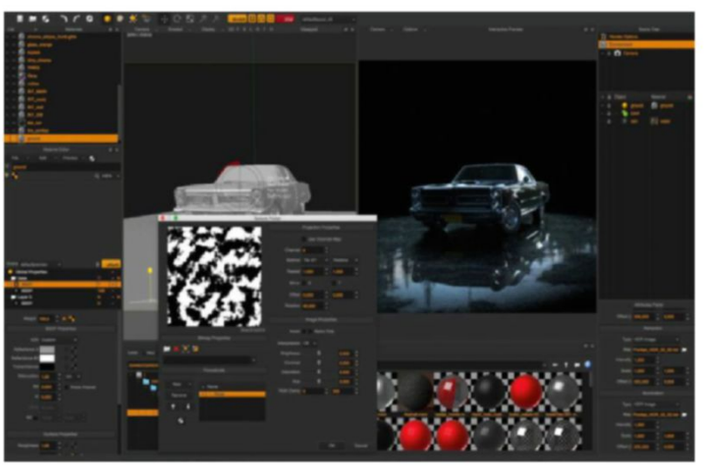
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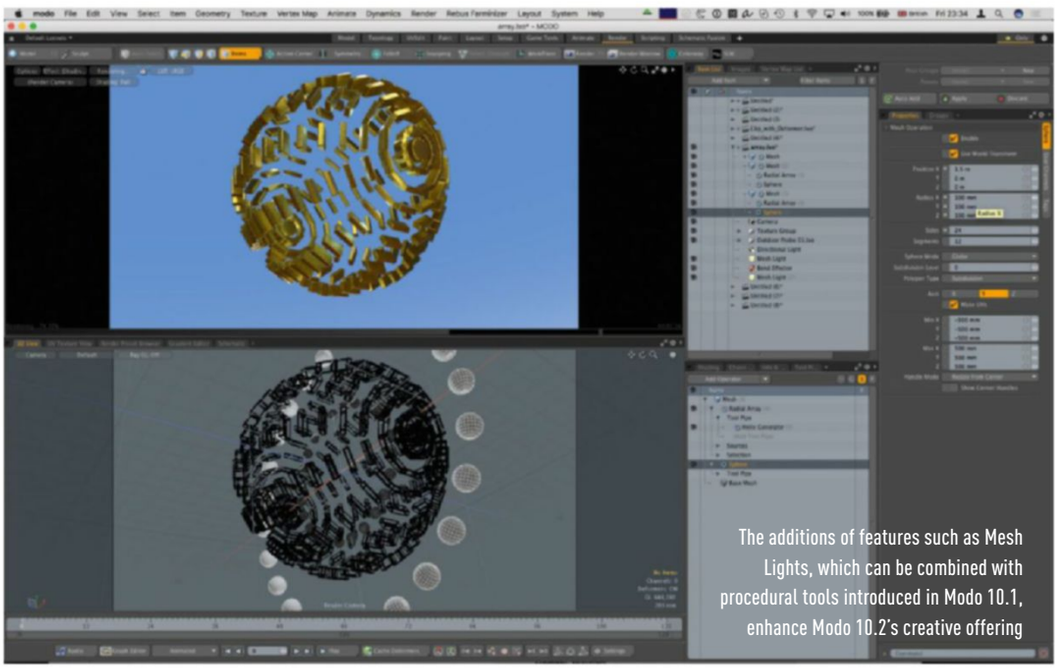


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The physically accurate renderer gets a CUDA-based GPU render engine, and the Multilight system is now a standalone tool

SOFTWARE REVIEW

Modo 10.2

PRICE £1,199 | COMPANY The Foundry | WEBSITE www.thefoundry.co.uk



The additions of features such as Mesh Lights, which can be combined with procedural tools introduced in Modo 10.1, enhance Modo 10.2's creative offering



AUTHOR PROFILE
Mike Griggs
Mike is a digital content creator with over two decades of experience creating Mograph, VFX and CGI for a wide range of clients.
www.creativebloke.com

FEATURES

- New Topology Tools
- MeshFusion Enhancements
- New MeshLighting options
- UI improvements
- Deformers can be cached

With this third and final instalment in its Modo 10 Series, The Foundry has tightened up the ship, with a range of improvements to some of the core toolsets within Modo: mainly its procedural modelling capabilities.

MeshFusion, the unique boolean modelling system has had a major overhaul with a much more intuitive UI, which doesn't rely on the old tree system, (for power users, the schematic view is still available). Instead there is now a clear set of icons which denote mesh use whether it's to be a Primary (visible) or to Subtractive Trim or Intersect Trim. Meshes can also be combined into a new Compound Trim item which can be used to cut away another mesh, while keeping the component parts live. This leads to the ability to create, very complex models which can be made airtight for 3D printing very quickly, with none of the frustration of the previous control system, which felt like it could break at any minute.

Topology tools have also been enhanced with a new Automatic Retopology tool, which can reduce complex meshes to a set number of quads. While not as intuitive as similar tools in ZBrush, for example, it is good to see that they are there, along with the new Retopo Guides which can help flow the polygons into the correct position, which is especially critical for models that are to be animated.

DEFORMATION CACHING

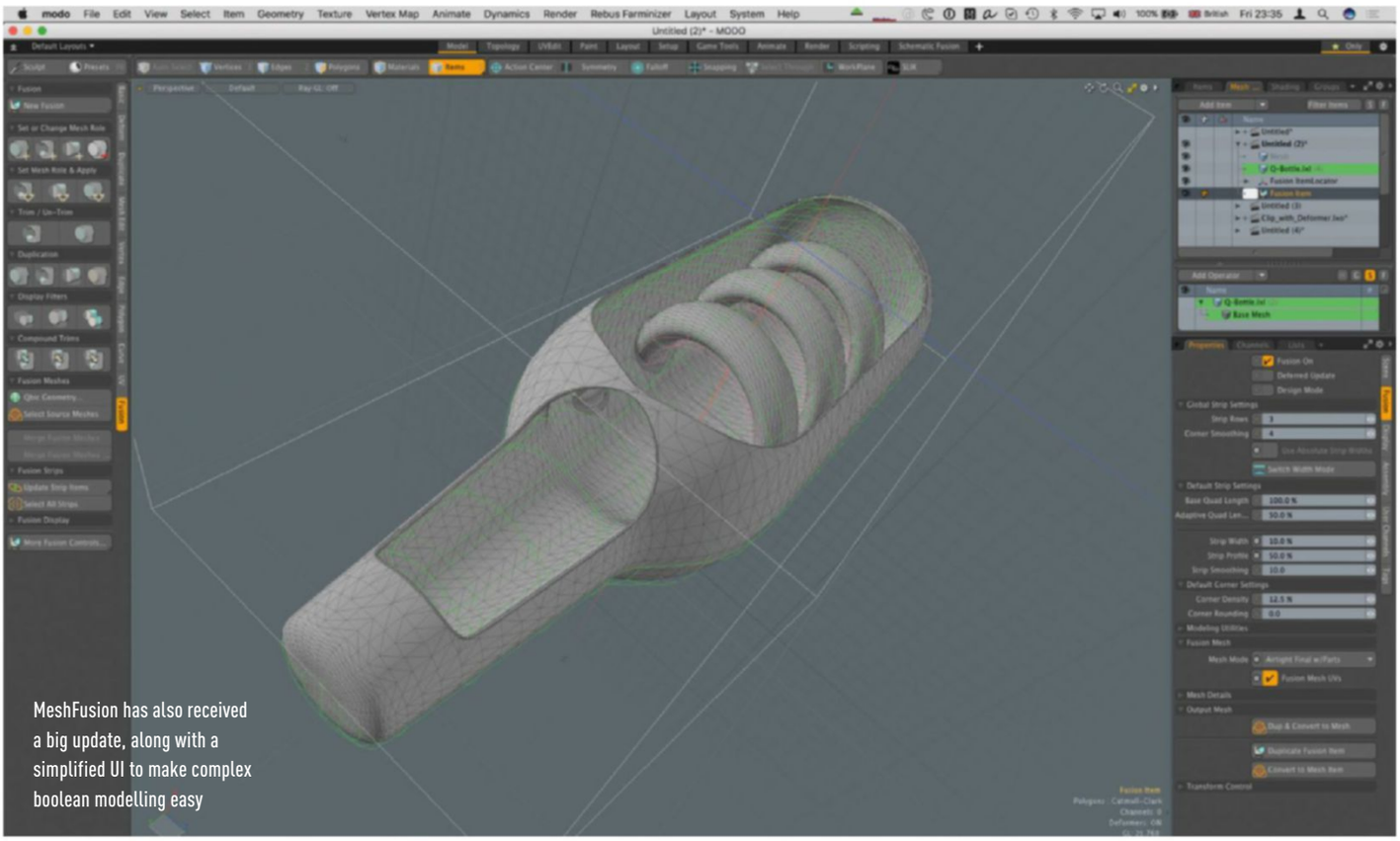
Speaking of animation, deformers can now be cached, which makes a huge difference to animation playback speed.

For power users, Assembly Alias Presets can be created, allowing interactions such as rigging, which have been created in the schematic view and can be shared with others.

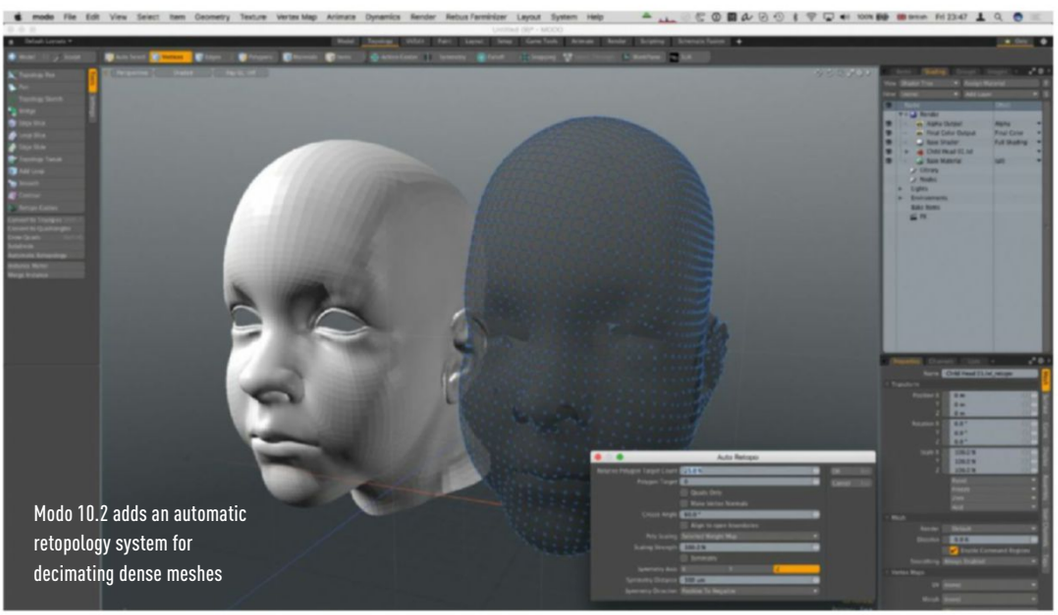
One of the big features for Modo 10.1 was the addition of a new procedural modelling system, this has been enhanced in Modo 10.2, with the addition of new slice tools and duplication options, such as the new Radial Array option, which when combined with the tools provided in Modo 10.1 can create some really compelling geometry.

Unfortunately, the major issues with the procedural system from 10.1 are still there, geometry manipulation slows down when things get heavy with the procedural modelling system.

Rendering and lighting have been improved with the addition of a new Mesh Light item, which when combined with a piece of geometry creates a Light object with it, this provides a more efficient, predicatable and straightforward way of lighting with meshes than



MeshFusion has also received a big update, along with a simplified UI to make complex boolean modelling easy



Modo 10.2 adds an automatic retopology system for decimating dense meshes

was previously possible with luminous textures.

All in all, Modo 10.2 is a solid release, but it still skirts around a lot of Modo's core issues. While the UI definitely feels a lot smoother to use, there is a definite learning curve to the new toolsets, and with the strides that Autodesk is making with Maya to make the once horrendous UI a lot more straightforward for new users, as well as Maxon's famed ease-of-use for Cinema 4D, other than the welcome addition of the new MeshFusion control method, there is little in the way of streamlining processes for new Modo users, which is a little disappointing.

So has the three-stage, staggered release of Modo 10 been a success? While a lot of the new features that have come along are really useful for existing Modo users, and allow them to get into more markets and create more compelling art, it is hard to recommend Modo 10 – even at the comparatively lower price – to new artists seeking an all-in-one digital content creation app. This will change once the viewport speed and general friendliness of the application are enhanced, and brought up to par with its competitors.

VERDICT

CALLING FOR A BETTER VIEWPORT

While Modo 10.2 is definitely the most refined version of Modo yet, there are still some major issues with the viewport. As a test I created a torus in Modo 10.2, Cinema 4D R18 and Maya 2017. I then very unscientifically wiggled them from side to side quickly using the viewport PAN option, this was all run on a MacBook Pro, running OS X Sierra. With Modo 10.2 there was a definite 'tearing' of the torus, where it seemed that it had been cut into strips, which simply did not happen in either Cinema 4D or Maya. When I created a procedural torus with Modo the tearing was there, but not as noticeable. Until Modo's viewport is up to the same quality and speed as its competitors, all its new tools won't shine like they should.



AUTHOR PROFILE
Paul Hatton
Paul leads a UK-based studio of visualisers. He delivers a whole host of projects including video and interactive environments.
www.cadesignservices.co.uk/services/3d-studio

SOFTWARE REVIEW

Corona 1.5

HIGHLY COMMENDED 3D WORLD

PRICE €548, €24.99 per month, €24.99 per year (student license) | **COMPANY** Render Legion | **WEBSITE** corona-renderer.com



Version 1.5's new Interactive LightMix lets you adjust lighting on the fly without re-rendering

For those of you who have been asleep these last few years, Corona is an unbiased renderer available both as a standalone application and as a plugin for 3ds Max (other plugins are in development).

With the recent release of version 1.5, and an impressive feature set appearing in recent versions, we wanted to put it through its paces and find out just what Corona can do.

The rendering market is competitive and there is a wide range of options. Also, if you've been a visualiser for any length of time then you'll already have adopted one or more renderers. Hopefully this review will help you decide whether it's worth switching over.

SPEED AND QUALITY

The main thing I love about Corona, and I know this is true for a lot of people, is the fact that Render Legion has stripped away a lot of the technical settings, which in many renderers (historically) have required a PhD in physics to understand. Their defaults work well out of the box, and are easy to fine tune for further quality and speed improvements. It compares well with Arnold, for example, which also works so well straight out of the box in Maya.

Mentioning Arnold, brings me to Corona's interactive renderer. There are two things that people want from real-time renderers; speed and features. Corona delivers on both fronts and you won't be disappointed. Obviously any results you get are going to be dependent on your hardware, but Corona certainly makes



The VFB has been improved and includes support for post effects

FEATURES

- Interactive LightMix
- Corona materials
- VFB features
- LUTs
- Corona distance map


Corona 1.5 adds a new interactive relighting feature and a range of new post-processing effects

excellent use of the resources that are available to it.

INTERACTIVE LIGHTMIX

My favourite thing about the 1.5 release is the incredible Interactive LightMix tool. The example videos on Corona's website do a fantastic job of communicating how effective it is. With pretty much instant results, users are able to adjust the intensity and colour of lights. And this isn't just small changes that work. It will allow you to turn scenes from daytime to night-time and it completely removes the need to mess around with settings and waste time re-rendering until you get it right. The ability to save and load pre-saved setups is also incredibly helpful. The developers have also promised to improve this workflow further, which is hard to believe, but I'm sure they'll deliver if past performance is anything to go by.

One of the other things that Render Legion has tried to achieve through version 1.5 is to reduce the need for post-production software. These tools are much more common across other renderers and therefore I feel that these features are more a case of catch-up rather than taking new ground. That being said, the tools are now pretty extensive and easy to use. Another area in which Corona has played catch up is in the area of providing a distance map, which allows the effect of a map to be driven by the distance it is from one or more objects. The implementation is strong, but it has already been seen in other renderers like V-Ray.

Other notable features in 1.5 include amends to the Corona materials and displacement improvements. This shows that Render Legion is committed to providing a well-rounded feature-set that can compete in the competitive, and crowded rendering market.

The 1.5 release sees a mix of some incredibly impressive features, as well as ensuring that there is a depth of features that can compete with all the other renderers on the market.

The interactive renderer and the LightMix tool make the 25 Euros a month almost a no-brainer for all studios, including one-man bands. There's also the option of a one-off cost too, priced at 548 Euros (around $499), if you prefer. Either way, it's good value for money.


Corona Materials have been updated to match evolving industry standards


Textured Corona materials can now be previewed directly in the 3ds Max viewport

VERDICT

LIGHTMIX SYSTEM

The new LightMix function provided in 1.5 is simple to use and incredibly powerful. This will save artists a lot of time on projects and enable them to focus on what's important, which is creating beautiful renders.

SOFTWARE REVIEW

Phoenix FD 3.0 for 3ds Max



AUTHOR PROFILE
Rob Redman
Rob is a 3D artist and creative director, working across print, film and TV. When not in the studio he is often found presenting at industry events such as FMX and Siggraph.
www.pariahstudios.co.uk

PRICE $830 (workstation, plus floating user and sim licence) | **COMPANY** Chaos Group | **WEBSITE** www.chaosgroup.com

Although simulations are a specialised area, many 3D artists find a need to dabble in a variety of liquid, fire, smoke and such effects. Generalists and freelancers are a prime example, as are smaller studios. The biggest hurdle for these users is often the steep learning curve involved. Specialists can justify investing the time and effort, but that's not always the case for indie users, which is where plugins like Phoenix FD come in.

From the get-go Phoenix FD 3.0 for 3ds Max is a joy to use and newcomers will have no trouble getting to grips with how the software works. The toolshelf is there upon launch, once you install, which, along with the standard controls, houses a number of very useful and useable presets.

These presets are new in version 3 and using them is a great way to handle the software, as they offer scripted simulation setups, allowing more time to be spent learning how the details work, rather than the scene set-up process. While just one of many new additions in version 3, these presets are worth the upgrade just for their time-saving ability; a godsend for new users.

The presets cover a range of uses from fire and explosion, to smoke and fluids (there's also a new FLIP fluid solver) and the default settings for these are very good. All you need to do is select the mesh you want to set fire to, then clock the icon for the fire preset. Phoenix FD then sets up the necessary components and relationships, ready for you to press simulate.

You can stop the sim at any point, then continue, or stop and delete as needed. While the simulation is running you can navigate the scene, with the refresh rate remaining pretty smooth for all but the fastest of moves, at which point the sim continues but the scene drops to bounding boxes.

The viewport previews have been updated in version 3 and now give a good representation of the final rendered result, saving time on tests and generally making the workflow smoother and less frustrating.

Selecting the simulation in the outliner opens up the properties panels. From here you can access just about any attribute imaginable, but in clearly labelled and logically laid out segments. Overall settings are open by default making it easy to set the resolution and other properties. You can unfold panels to deal with heat, fuel and more.

Accurate simulations can often be hard work, but Phoenix FD 3.0 alleviates that pain with its new shelf items. Not only is it faster to set up and get results, but those results are better than ever, with new solvers and much more helpful viewport previews.

VERDICT

FEATURES

Versions for different render engines

Presets aid learning and jump-starting a project

Comprehensive controls, logically laid out

Output to Alembic

HISTORY

CHAOS GROUP

Although it's best known for its widely loved V-Ray render engine, Chaos Group has developed a few tools for VFX artists, as well as having an active user group and the Chaos Group Labs, which is home to a fun and informative podcast, as well as a number of very useful user guides.



With its new FLIP liquid solver and improved smoke and fire solver, Phoenix FD is now more powerful and able to bring more realism to VFX projects

SOFTWARE REVIEW

Maxwell Render 4



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PRICE €495-€695 (dependant on license and host type) | **COMPANY** Next Limit | **WEBSITE** www.maxwellrender.com

Maxwell Render has long had a reputation for its high-quality results, but at the expense of speed. However, this latest version demonstrates that Next Limit has listened to its users, adding major speed enhancements alongside many other changes.

The majority of time lost while working on a CG project is usually down to test renders, either looking at lighting, or checking materials. In recent times, developers have taken a couple of approaches.

Firstly some kind of fast interactive preview, where the user gets to see a lower-quality preview, that updates as the camera is moved. The second option is to free up the CPU and use the power of the GPU to drive the render.

The benefits of GPU rendering are many, but essentially boil down to the cost/speed relationship. Adding GPU cores is far less expensive than CPU cores, which also means it's favourable to shipping a project out to a farm and is scalable too.

Maxwell takes advantage of this in version 4, with support for GPU rendering on PC, but not on Mac. It looked for a while like support for the physical sky would be constricted to the CPU but luckily GPU rendering can cope with Maxwell's excellent physical sun and sky system. However, the Maxwell Hair tool is not supported, yet.

STANDALONE MULTILIGHT

When it comes to actually using Maxwell not a huge amount has changed. The interface is still slick and simple, belying the power on tap. Setting up a scene is easy, with meshes being used as scene lighting, via a corresponding material. You can light with the dome, image, or physical options, or combine multiples, but it has to be said that Multilight really comes into its own when you have emitters in the scene.

Multilight is Maxwell's, now standalone, tool for re-lighting scenes during or after the render. In essence, you have a cache for each light source, which you can change the intensity or colour of using a set of sliders. This can be applied to physical skies as well as material emission. A few minutes here can save you hours.

The material system is just as intuitive: Maxwell materials are easy to construct, all using the same editor, with different types adding layers for type changes, like light emission. This works based on physical materials and is similar to the camera system and scene control, which is set up like a real camera.

The beauty of the images, with the speed advantages in Maxwell 4, make it a contender for King of the Renderers.

VERDICT ●●●●○

FEATURES

Choice of CPU or GPU for rendering

Multilight for relighting

New searchable materials library

Multiple host support

HISTORY

NEXT LIMIT

Maxwell is developed by Next Limit, the company behind RealFlow, alongside some less well-known simulation software. This simulation background is key. Being a fundamental part of the company, this means that Maxwell isn't an approximation or biased, but is a full light simulation, which is, in part, why the results look so believable.



This stunning car render is by Maciek Ptaszynski, read his breakdown here **www.bit.ly/216-maxwell4**

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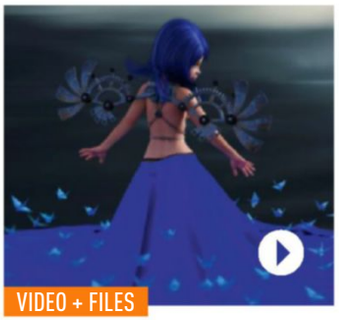
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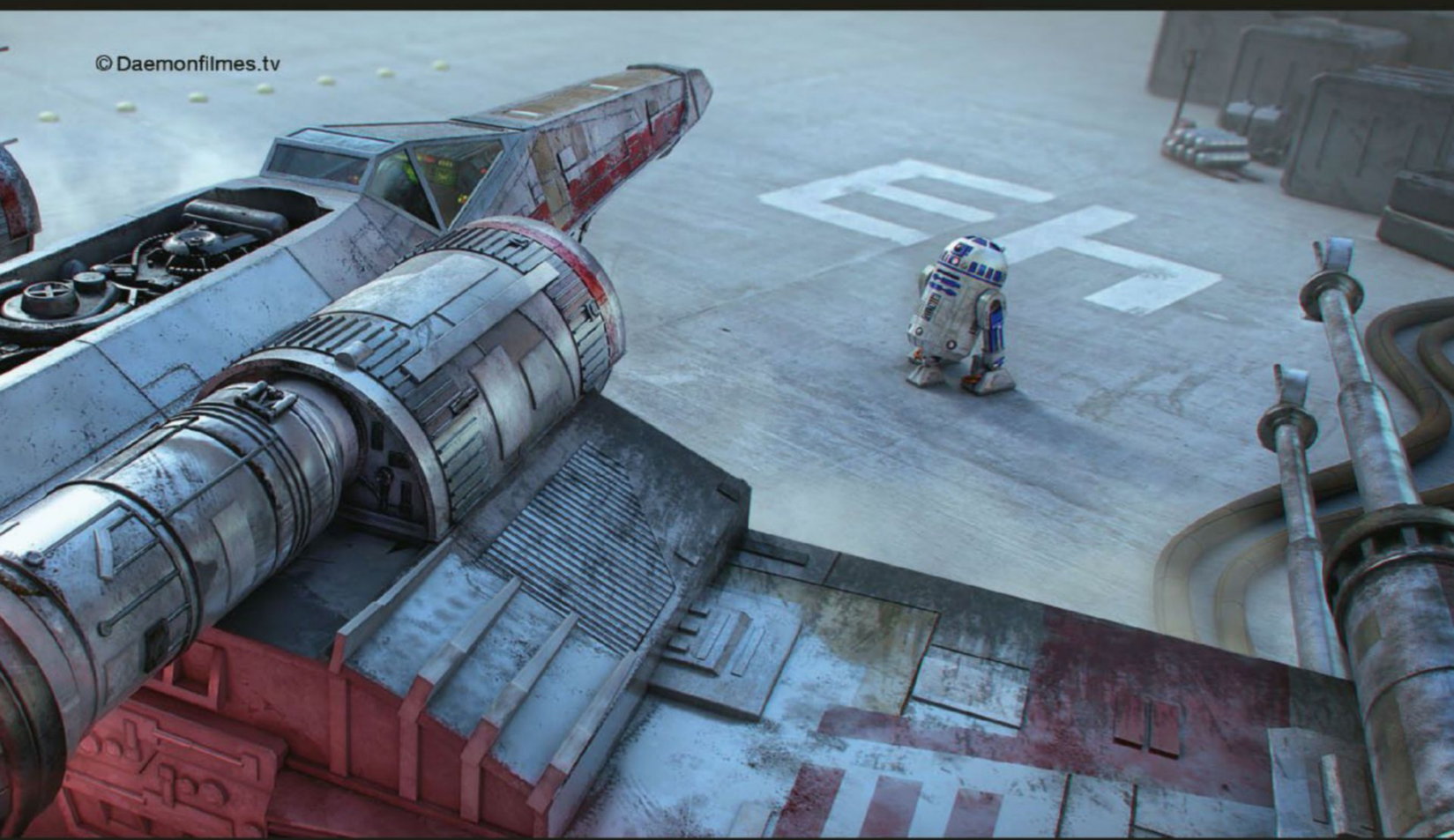
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